NGA 2000

FLAME IONIZATION DETECTOR 2
ANALYZER MODULE

Rosemount Analytical

NOTICE

THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

Rosemount Analytical's NGA 2000 system of Modular Gas Analyzers and Controllers are patented, under U.S. Patent 5.787.015.

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PREFACE

PURPOSE/SAFETY SUMMARY

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of this particular NGA 2000 module.

Some sections may describe equipment not used in your configuration. The user should become thoroughly familiar with the operation of this module before operating it. Read this instruction manual completely.

To avoid explosion, loss of life, personal injury and damage to this equipment and on-site property, all personnel authorized to install, operate and service this equipment should be thoroughly familiar with and strictly follow the instructions in this manual. Save these instructions.

If this equipment is used in a manner not specified in these instructions, protective systems may be impaired.

DANGER is used to indicate the presence of a hazard which **will** cause **severe** personal injury, death, or substantial property damage if the warning is ignored.

WARNING is used to indicate the presence of a hazard which **can** cause **severe** personal injury, death, or substantial property damage if the warning is ignored.

CAUTION is used to indicate the presence of a hazard which **will or can** cause **minor** personal injury or property damage if the warning is ignored.

NOTE is used to indicate installation, operation or maintenance information which is important but not hazard-related.

WARNING: ELECTRICAL SHOCK HAZARD

Operate this equipment only when covers are secured. Servicing requires access to live parts which can cause death or serious injury. Refer servicing to qualified personnel.

For safety and proper performance, this module must be connected to a properly grounded three-wire source of electrical power.

WARNING: POSSIBLE EXPLOSION HAZARD

This equipment is used in the analysis of sample gases which may be flammable, and the burner fuel used in the ionization process IS flammable. A system of intrinsically safe electronics and an explosion proof tower are used to prevent any ignition of a flammable gas leak. For this to be effective, the module MUST be placed in a well-ventilated area, with unobstructed air flow around it.

DO NOT place it within another enclosure without assuring this ventilation.

DO NOT obstruct the vent holes on the top and sides of the module.

DO NOT place the FID module within another enclosure unless the latter has a guaranteed air circulation such as to dilute a worst case fuel or sample leak below 25% of the LEL. Doing so will negate the safety features and may result in an explosion, serious injury, property damage and death.

WARNING: FLAMMABLE SAMPLES

Consult the factory if flammable samples will be measured.

WARNING: PARTS INTEGRITY

Tampering with or unauthorized substitution of components may adversely affect safety of this product. Use only factory-approved components for repair.

WARNING: POSSIBLE EXPLOSION HAZARD

Ensure that all gas connections are made as labeled and are leak free. Improper gas connections could result in explosion and death.

WARNING: STATIC ELECTRICITY

Circuit boards in this instrument are static-sensitive. Take all static precautions when handling the circuit boards.

WARNING: POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow restrictor in the fuel inlet fitting. DO NOT REMOVE THE FUEL INLET RESTRICTOR. Use the correct fuel flow restrictor for the fuel being used. Do not use 100% hydrogen fuel in a 40% H_2/60% He configured FID module. Replace with factory supplied fitting only.

CAUTION: PRESSURIZED GAS

This module requires calibration with a known standard gas. See General Precautions for Handling and Storing High Pressure Gas Cylinders at the rear of this manual.

CAUTION: CONTROLLED ENVIRONMENT

This equipment is for use in a controlled environment. Refer to the specifications (page P-7) in this manual for environmental conditions.

CAUTION: HOT OVEN COMPONENTS

The oven and sample manifold are controlled to 80°C. Allow the analyzer to cool down before touching any of these components.

Note

This Analyzer Module is completely leak-tested at the factory for gas leakage. The user is responsible for testing for leakage at the inlet and outlet fittings on the rear panel (with a test procedure chosen by the user). The user is also responsible for leak-testing periodically and if any internal pneumatic components are adjusted or replaced. See leak test instructions on page 2-5.

GLOSSARY

ANALYZER MODULE

The module that contains all sensor/detector components for development of a Primary Variable signal; includes all signal conditioning and temperature control circuitry.

BACKPLANE

The interconnect circuit board which the Controller Board, Power Supply, Analyzer Module power and network cables, I/O Modules and Expansion Modules plug into.

CONTROL MODULE

The Operator Interface plus the Controller Board.

CONTROLLER BOARD

The computer board that serves as the Network Manager and operates the Display and Keypad.

DILUENT

The material used to dilute another material. In air, nitrogen is the diluent for the oxygen we need to breathe.

DISTRIBUTION ASSEMBLY

The Backplane and the card cages that hold I/O and Expansion Modules.

EXPANSION MODULE

A circuit board that plugs into the Backplane from the front of the Platform and performs special features not related to I/O functions.

FLAME IONIZATION

A technique for measuring hydrocarbon gases. A flame is used to ionize the carbon atoms, and the charge thus generated is measured.

GAS CHROMATOGRAPHY

A technique of separating gas stream components using absorption media, allowing the detector to measure individual species within the stream.

HYDROCARBON

A chemical containing only hydrogen and carbon atoms. Methane, propane and octane are hydrocarbons.

HYDROCARBONS

Organic molecules containing just carbon and hydrogen. Methane, propane and oils are example of hydrocarbons.

I/O MODULE

A circuit board that plugs into the Backplane from the rear of the Platform. Has a connector terminal for communication with external data acquisition devices and provides an input/output function.

IONIZATION

Generation of electrically charged particles from a neutral material. In the FID, the flame causes hydrocarbon molecules to split into such charged ions.

LED

Light Emitting Diode – a solid state indicator light.

OPERATOR INTERFACE

The Display and Keyboard.

PLATFORM

Any workable collection of the following: Controller Board, Power Supply, Distribution Assembly, Enclosure and Operator Interface.

POWER SUPPLY

Any of a variety of components that provides conditioned power to other NGA 2000 components, from the Power Supply Board that plugs into the front of the Backplane in a stand-alone instrument to several larger ones that can power larger collections of modules and components.

PRIMARY VARIABLE

The measured species concentration value from an Analyzer Module.

PURGE

A safety system that uses an air flow to keep any fuel gas leak under the lower explosive limit (LEL).

SAMPLE CONDITIONING

The process of altering the state of the sample gas so as to make it suitable for an analyzer. This includes removing condensable water, changing the pressure, and filtering.

SECONDARY VARIABLE

Data placed on the network by a module regarding current status, e.g., sample flow, source voltage and other diagnostic information.

SOFTKEYS

The five function keys located below the front panel display; they assume the function displayed directly above each on the display, a function dictated by software.

SPECIES

A particular gas within a mixture. Oxygen is a species in air.

SUBNODE

A subsection of the analyzer devoted to measuring one of the species for which it is set up. Analyzers with multiple subnodes can measure multiple gases.

SYSTEM

Any collection of Analyzer Module(s), Platform(s), I/O Module(s) and Expansion Module(s).

SPECIFICATIONS - GENERAL

MEASUREMENT SPECIES	Total hydrocarbons
H_2/He FUEL	low range: 0 to 4 ppm CH_4, through 0 to 1% CH_4 high range:: 0 to 50 ppm CH_4, through 0 to <5% CH_4
REPEATABILITY	≤1% of fullscale at a constant temperature, sample flow and fuel, burner air and sample pressure
MINIMUM DETECTABLE LEVEL	0.04 ppm H_2/He fuel 0.01 ppm H_2 fuel – methane equivalent
NOISE	≤1% of fullscale, peak to peak
LINEARITY	≤ ±1% of fullscale for H_2/He fuel and H_2 fuel
RESPONSE TIME	<1 second for bypass flow rate of 500 cc/min (for a sample change at the rear panel connector of the instrument)
ZERO DRIFT	≤ ±1% of fullscale/24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air and sample pressure
SPAN DRIFT	≤ ±1% of fullscale/24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air and sample pressure
EFFECT OF TEMPERATURE	≤ ±2% of fullscale for any temperature change of 10°C and rate of change less than 10°C/hour
OPERATING TEMPERATURE	41°F to 104°F (5°C to 40°C)
OPERATING HUMIDITY	<95% relative humidity, non-condensing
POWER REQUIREMENTS	+24 VDC ±5%, 120 W max.. direct to analyzer module; Ripple and Noise: <100 mV peak to peak Line and Load Regulations: <±1%

SPECIFICATIONS - GAS REQUIREMENTS

BURNER AIR	Hydrocarbon free grade air
FLOW RATE	350 to 400 ml/min
THC	≤0.1 ppm CH_4
SUPPLY PRESSURE	1725 to 3450 hPa-gauge (25 to 50 psig)
FUEL GAS (STANDARD)	Premixed 40% hydrogen and 60% helium
FLOW RATE	110 to 110 ml/min.
THC	≤0.5 ppm CH_4
SUPPLY PRESSURE	3101 to 3450 hPa-gauge (45 to 50 psig)

WARNING: POSSIBLE EXPLOSION HAZARD

Unless this Analyzer Module is factory- or field-configured specifically for using 100% hydrogen fuel, DO NOT USE PURE HYDROGEN FUEL. An explosion resulting in severe personal injury or death could occur. Also, each Analyzer Module is factory-configured for either mixed or pure hydrogen fuel, and cannot use the fuel for which it was not configured unless field reconfiguration is done.

SAMPLE	Non-flammable (below 100% of LEL)
FLOW RATE	0.5 to 2.0 L/min.
SUPPLY PRESSURE	483 to 1035 hPa-gauge (7 to 15 psig)
TEMPERATURE	32°F to 248°F (0°C to 120°C), <20°C variance/24 hours, <10°C variance/hour
PARTICULATES	Filtered to <2 microns
DEWPOINT	<45°C

SPECIFICATIONS - PHYSICAL

MATERIALS IN CONTACT WITH SAMPLE	Stainless steel, Teflon, glass-filled Teflon, Viton
DIMENSIONS	See Figure 2-5, Outline and Mounting Dimensions
WEIGHT	10.43 kg (23 lbs.)
MOUNTING	Horizontal
CASE CLASSIFICATION	General Purpose for installation in weather protected area
MAX. SEPARATION FROM PLATFORM	1600 m (1 mile)

SPECIFICATIONS - GAS CONNECTIONS

SAMPLE IN	1/4 inch O.D. tube fitting
BURNER AIR IN	1/4 inch O.D. tube fitting
FUEL IN	1/4 inch O.D. tube fitting
BYPASS OUT	1/4 inch O.D. tube fitting
BURNER EXHAUST OUT	3/8 inch O.D. tube slip-fit connection, tygon or equivalent (this connection shall slope downward 6° minimum from horizontal)

THE BURNER EXHAUST AND BYPASS OUT SHALL BE VENTED TO ATMOSPHERIC PRESSURE AND TO A NON-CLASSIFIED LOCATION.

See the Preface Section of the Platform manual for specifications regarding Platform related components.

CUSTOMER SERVICE, TECHNICAL ASSISTANCE AND FIELD SERVICE

For order administration, replacement Parts, application assistance, on-site or factory repair, service or maintenance contract information, contact:

Rosemount Analytical Inc.
Process Analytical Division
Customer Service Center
1-800-433-6076

RETURNING PARTS TO THE FACTORY

Before returning parts, contact the Customer Service Center and request a Returned Materials Authorization (RMA) number. Please have the following information when you call: *Model Number, Serial Number, and Purchase Order Number or Sales Order Number.*

Prior authorization by the factory must be obtained before returned materials will be accepted. Unauthorized returns will be returned to the sender, freight collect.

When returning any product or component that has been exposed to a toxic, corrosive or other hazardous material or used in such a hazardous environment, the user must attach an appropriate Material Safety Data Sheet (M.S.D.S.) or a written certification that the material has been decontaminated, disinfected and/or detoxified.

Return to:

Rosemount Analytical Inc.
4125 East La Palma Avenue
Anaheim, California 92807-1802

TRAINING

A comprehensive Factory Training Program of operator and service classes is available. For a copy of the *Current Operator and Service Training Schedule* contact the Technical Services Department at:

Rosemount Analytical Inc.
Phone: 1-714-986-7600
FAX: 1-714-577-8006

DOCUMENTATION

The following NGA 2000 Flame Ionization Detection Module instruction materials are available. Contact Customer Service or the local representative to order.

748364 Instruction Manual (this document)

COMPLIANCES

This product may carry approvals from several certifying agencies, like The Canadian Standards Association (CSA), which is also an OSHA accredited Nationally Recognized Testing Laboratory (NRTL), and LCIE - a French Notified Body.

The certification marks appear on the product name-rating plate.

NRTL /C

CE 0081 Ex II 2 G

LCIE 98 ATEX 6004 X
EEx d ib IIB (+H_2) T6
0°C Ta +40°C
Date of Manufacture:

Rosemount Analytical has satisfied all obligations from the European Legislation to harmonize the product requirement in Europe.

This product complies with the standard level of NAMUR EMC Recommendations (1993). **NAMUR**

This product satisfies all obligations of all relevant standards of the EMC framework in Australia and New Zealand.

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NOTES

QUICK STARTUP PROCEDURE

The purpose of this reference guide is to provide a easy to follow, step by step procedure through initial start up and ignition of the FID2 Analyzer Module. This procedure assumes that the customer has already made all necessary electrical and gas connections and established the proper network connections.

1. Turn on power to the instrument. The #1 LED (POWER) will illuminate. The #3 LED (BLOCK) will begin flashing.

2. If sample gas has been connected and the sample pressure to the analyzer is sufficient to provide an accurate reading, the #4 LED (SAMPLE) will be illumninated.

3. Allow the analyzer module to warm up and the burner block temperature to reach the proper minimum ignition temperature (50°C). When the burner block temperature reaches the minimum ignition temperature, the #5 LED (IGNITE OK) will come on.

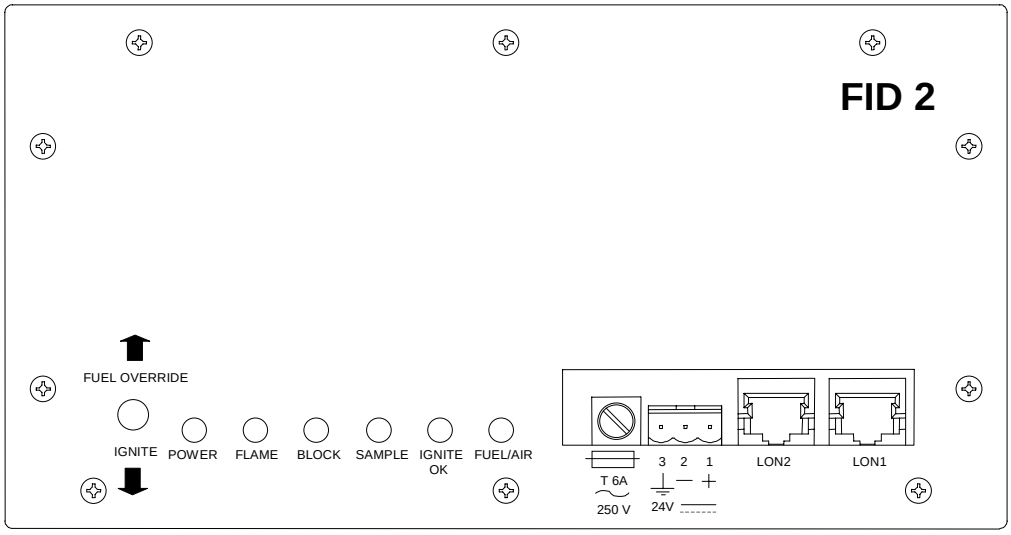


FIGURE P-1. FID2 FRONT PANEL

4. The instrument is now ready to be lit. Lighting the burner can be conducted in one of two methods: a) manual ignition from the front panel of the Analyzer Module or b) autoignite from the Platform.

   a) To light the instrument from the Analyzer Module, hold the "FUEL OVERRIDE/IGNITE" switch (located to the left of the indicator lights) in the up (FUEL OVERRIDE) position for 30 seconds. Immediately move the switch to the down (IGNITE) position. The "IGNITE" mode is automatically set to stay on for a preset time period and does not require the switch to be held down. If the lighting procedure was successful, the #2 LED (FLAME) will begin flashing as the flame temperature rises to the correct operating temperature. Once this LED becomes solidly lit, the flame has reached operating temperature.

   b) To light the instrument from the Platform using the autoignite mode, simply press the "light" softkey shown in the "Light Flame" menu of the Platform. The Analyzer Module will begin to go through an automated sequence of enrichment and ignition similar to the manual mode described in step 5. If the burner fails to light on the first try, the Analyzer Module will perform 2 more tries before terminating the autoignite sequence. If the Analyzer Module fails to light after 3 attempts, an error message will be displayed showing the cause of the fault.

5. If the burner fails to light, check all gas connections for proper gas composition and pressure, block temperature, and outlets for obstructions. Repeat step 4.

6. If the flame is lit, the #2 LED will begin flashing. Once the flame temperature has reached the correct operating temperature, the LED will remain on solid.

7. If the fuel and air pressures and ratios are within proper operating parameters to support a continuous flame operation, the #6 LED (FUEL/AIR) will illuminate. This light will not be on before or during flame ignition.

8. Once the burner block temperature reaches the control temperature of 80°C, the #3 LED will stay on solid.

9. If the instrument has been successfully lit, the temperatures are up to proper operating levels, and the fuel, air, and sample gases are properly adjusted to support the flame and achieve reliable results, all 6 indicator lights will be lit solid.

The unit is now ready for calibration or burner optimization.

1 INTRODUCTION

1.1 OVERVIEW

This manual describes the Flame Ionization Detector (FID 2) Analyzer Module of Rosemount Analytical's NGA 2000 Series of gas analysis components. See Figure 1-1.

The FID 2 Analyzer Module is designed to use a flame ionization technique to measure the total concentration of hydrocarbon (including certain oxygenated hydrocarbons) components within the sample stream.

The entire FID 2 Analyzer Module is designed as a module with electrical connections at its front, and gas connections made from the rear. All electronics relative to sample control and signal conditioning are included in this module.

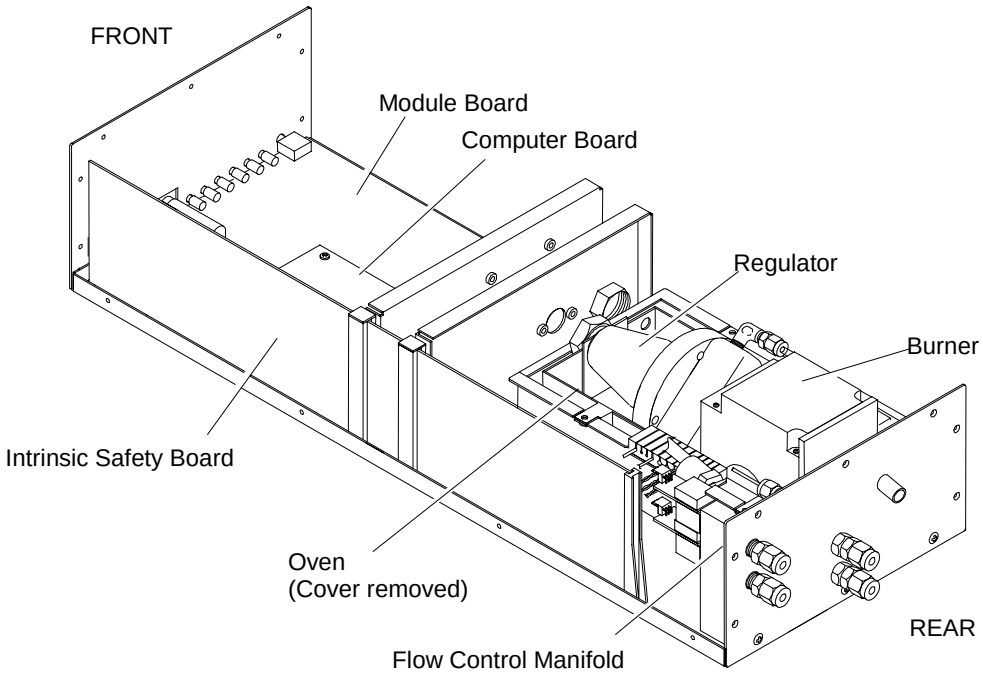


FIGURE 1-1. FID 2 ANALYZER MODULE

1.2 TYPICAL APPLICATIONS

Typical applications for the FID 2 Analyzer Module include:

- The monitoring of atmospheric air for low-level total hydrocarbon contaminants
- Determining the total hydrocarbon content of exhaust emissions from internal combustion engines
- Carbon bed monitoring
- Determining the total hydrocarbons content of process and product gases from air separation plants

1.3 THEORY OF TECHNOLOGY

This Analyzer Module uses the flame ionization method of detection. The sensor is a burner in which a regulated flow of gas sample passes through a flame sustained by regulated flows of a fuel gas (hydrogen or a hydrogen/diluent mixture) and air.

Within the flame, the hydrocarbon components of the sample stream undergo a complex ionization that produces electrons and positive ions. Polarized electrodes collect these ions, causing current to flow through an electronic measuring circuit.

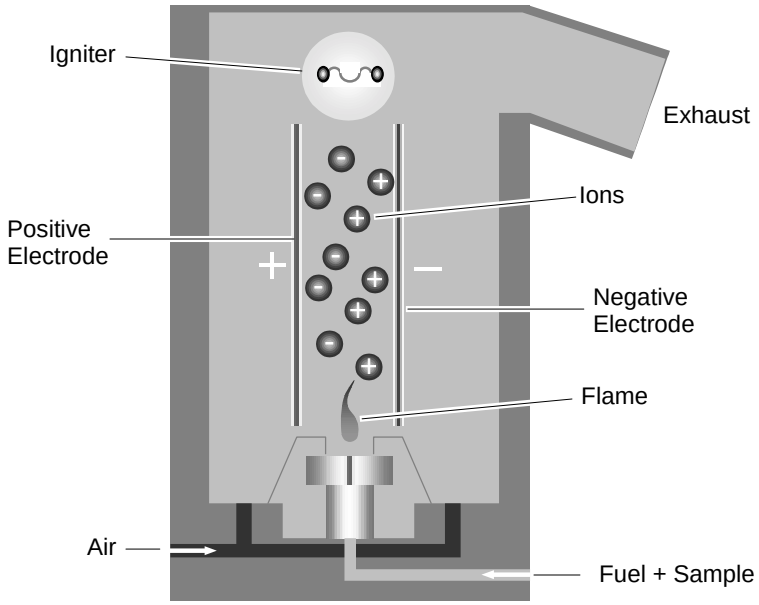
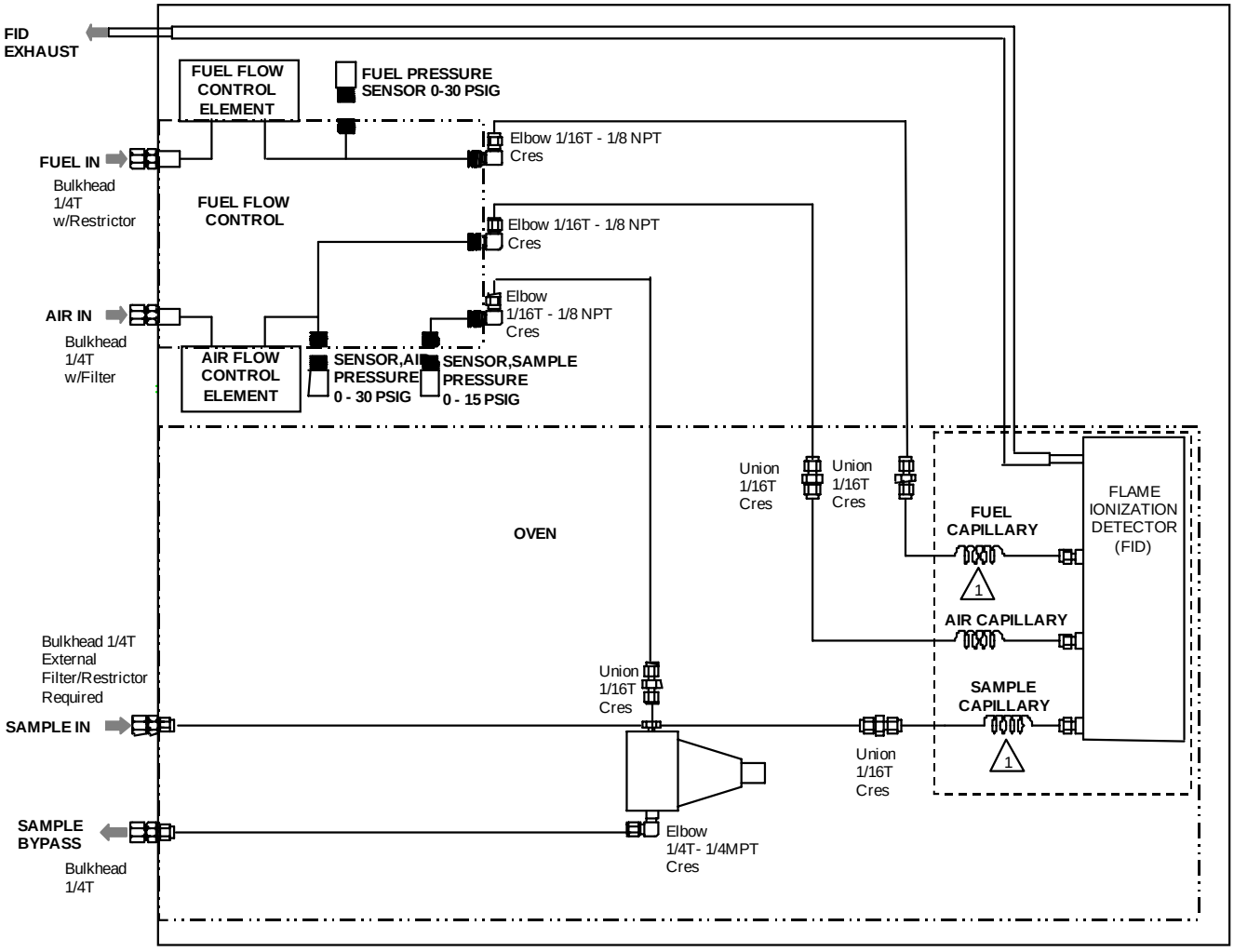


FIGURE 1-2. FLAME IONIZATION DETECTION TECHNOLOGY

The ionization current is proportional to the rate at which carbon atoms enter the burner, and is therefore a measure of the concentration of hydrocarbons in the sample.

The gas pressures are continuously monitored and controlled through electronic pressure transducers.

The measurement of concentration is placed on the network, where it can be shown on the Platform Display or on other data acquisition devices.



1 FOR STANDARD MIXED FUEL APPLICATION USE 658146 FUEL CAPILLARY AND 659031 SAMPLE CAPILLARY.
FOR 100% FUEL APPLICATION USE 658145 FUEL CAPILLARY AND 659033 SAMPLE CAPILLARY.

FIGURE 1-3. FID 2 ANALYZER FLOW DIAGRAM

1.4 GAS SAFETY FEATURES

The FID 2 module is divided into two parts - a pneumatic section and an electronic section. The two sections are separated by a pair of solid partitions to prevent any leak of gas in the pneumatic section from reaching the electronics. The electrical

connections into the pneumatic section are made intrinsically safe by a series of over-voltage protection devices and current limiting resistors. The burner itself is an explosion-proof assembly. The combination of these two techniques allows the analyzer to meet international safety standards without the use of an expensive continuous-dilution purge - but ONLY when it is installed in a general purpose area with good air circulation.

WARNING: POSSIBLE EXPLOSION HAZARD

Hydrocarbon concentration(s) in the sample gas must be below the Lower Explosion Limit (LEL).

All tubing ahead of the burner is rigid metallic tubing assembled with ferrule/nut type compression fittings. However, should an internal fuel leak occur, a worst-case leak would be dissipated below 25% of the LEL of hydrogen by natural dilution outside of the pneumatic section before it could be ignited by any external ignition source, and there is nothing within the pneumatic section to ignite it.

The FID 2 is designed to use 100% hydrogen fuel or 40% H_2/60% He fuel at a maximum inlet pressure of 3446 hPa-gauge (50 psig). A different flow restrictor is used for each fuel type[1].

WARNING: POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow restrictor[1] at the fuel inlet. DO NOT REMOVE THE FUEL INLET RESTRICTOR.

1.5 FUEL GAS OPTION

The standard FID 2 Analyzer Module requires 40% hydrogen/60% helium burner fuel gas. As an option, the analyzer module can be equipped to use 100% hydrogen fuel. The particular application and characteristics of the sample gas to be measured will dictate the preferred type of fuel. The following guidelines can be used for determining fuel gas type:

For measuring low-level hydrocarbons in ambient air or in other sample gas with relatively constant oxygen content, 100% hydrogen is preferable. It provides the highest obtainable sensitivity and maximum stability.

[1] The fuel restrictor is part of the Flow Control Manifold Assembly, which is specific to an application.

For monitoring internal combustion exhaust emissions or other sample gas with varying oxygen content, mixed fuel is preferable. In fact, a hydrogen/helium mixture is more desirable than a hydrogen/nitrogen mixture. With this type of sample, the use of mixed fuel gas minimizes the error introduced by oxygen synergism.

Changes in the burner air flow rate have little effect on signal strength. For a given flow, the signal can be optimized by adjusting the fuel flow rate.

Typical flow rates to the burner:

GAS FLOW	PURE H_2	MIXED FUEL
FUEL	30 cc/min	100 cc/min
SAMPLE	55 cc/min	13 cc/min
AIR	300 cc/min	400 cc/min

TABLE 1-1. GAS FLOW RATES

Note that with a 40/60 premixed fuel, the above flow rates amount to 40 cc (8%) hydrogen, 73 cc (14%) inert plus sample and 400 cc (78%) air, which compare closely to the 30 cc (8%) hydrogen, 55 cc (14%) inert/sample and 300 cc (78%) air noted earlier for straight hydrogen fuel.

ANALYZER CHARACTERISTICS	100% H_2	40% H_2/60% He
FULL SCALE SENSITIVITY	1 ppm, CH_4 to <2500 ppm CH_4	4 ppm, CH_4 to <1%, CH_4
FUEL CONSUMPTION	50 to 60 cc/min	100 to 110 cc/min
OPERATING SETTING FOR SAMPLE PRESSURE REGULATOR	345 hPa-gauge (5 psig)	345 hPa-gauge (5 psig)

TABLE 1-2. ANALYZER CHARACTERISTICS RELATIVE TO FUEL GAS

NOTES

2 INSTALLATION

2.1 UNPACKING

When the FID 2 Analyzer Module is received, carefully examine the shipping carton and contents for signs of damage. Immediately notify the shipping carrier if the carton or contents is damaged. Retain the carton and packing material until all components associated with the Analyzer Module are operational.

2.2 ASSEMBLY

The FID 2 analyzer module MUST NOT be placed within a conventional NGA platform, single module enclosure or dual module enclosure since the latter would not allow free flow of air around the module, thus violating its safety certification. The enclosure is designed so that this would be very hard to do anyway.

There is a special platform specifically designed to accept this module; consult the factory for details.

Install the Platform and I/O Module(s) according to guidelines in the Platform manual.

2.3 LOCATION

WARNING: POSSIBLE EXPLOSION HAZARD

Do not place the FID 2 module within another enclosure unless the latter has a guaranteed air circulation such as to dilute a worst case fuel or sample leak below 25% of the LEL. Failure to will negate the safety features and may result in explosion, serious injury, material damage and death. Also, do not cover the vent holes on the top and sides of the module.

Install the Analyzer Module in a clean, weather-proofed, non-hazardous, vibration-free location free from extreme temperature variations. For best results, install the Analyzer Module near the sample stream to minimize sample transport time.

Operating ambient temperature is 5 °C to 40 °C, limited to temperature changes of less than 10 °C/hr. Acceptable dew point range is less than 95% relative humidity, but not in excess of 40°C wet bulb temperature.

The cylinders of fuel, air, and calibration gases should be located in an area of relatively constant ambient temperature.

2.4 GASES

During normal operation, the Analyzer Module requires fuel and air to maintain the burner flame as well as suitable standard gases for. Refer to the criteria for selection of these gases in Section 2.4.2.

After initial startup or after startup following a prolonged shutdown, the analyzer may display baseline drift for a considerable period of time, particularly on the most sensitive range.

Commonly, the drift is caused by small amounts of organics (such as hydrocarbons) in the inner walls of the tubing in both the internal flow system and the external gas supply system. Drift results from any factor influencing the equilibrium of these adsorbed hydrocarbons, such as temperature or pressure. Hydrocarbons adsorbed within the analyzer in the gas passageways (or in the fuel or air lines) will elevate the overall baseline.

Note that this type of drift occurs only when the flame is burning. If drift occurs when the flame is extinguished, the electronic circuitry is at fault or the burner or cabling is contaminated with a conductive film. To minimize drift, use clean fuel and air, keep the analyzer clean, and locate the gas cylinders in an area of relatively constant ambient temperature.

The cylinders supplying all gases each should be equipped with a clean, hydrocarbon-free, two-stage regulator and a shutoff valve.

All new external gas tubing (except for SAMPLE BYPASS) is strongly recommended, preferably pre-cleaned, stainless steel, gas chromatograph-grade tubing. Thoroughly clean before use (if a hydrocarbon-based cleaning solvent such as acetone is used, purge tubing with dry nitrogen or helium for several minutes before using.)

Gas line connections are compression fittings. Do not use pipe thread tape on such fittings.

Since the oxidation of hydrogen is accompanied by the formation of water vapor, the exhaust tubing always should be slanted downward at least 6 degrees from horizontal. Otherwise, water may accumulate in the line, causing back pressure and noisy readings, or may back up in the line and flood the burner.

If the sample is toxic or noxious, or is to be reclaimed, connect the Bypass outlet to a suitable disposal system. Do not use any device that may cause back pressure in the line.

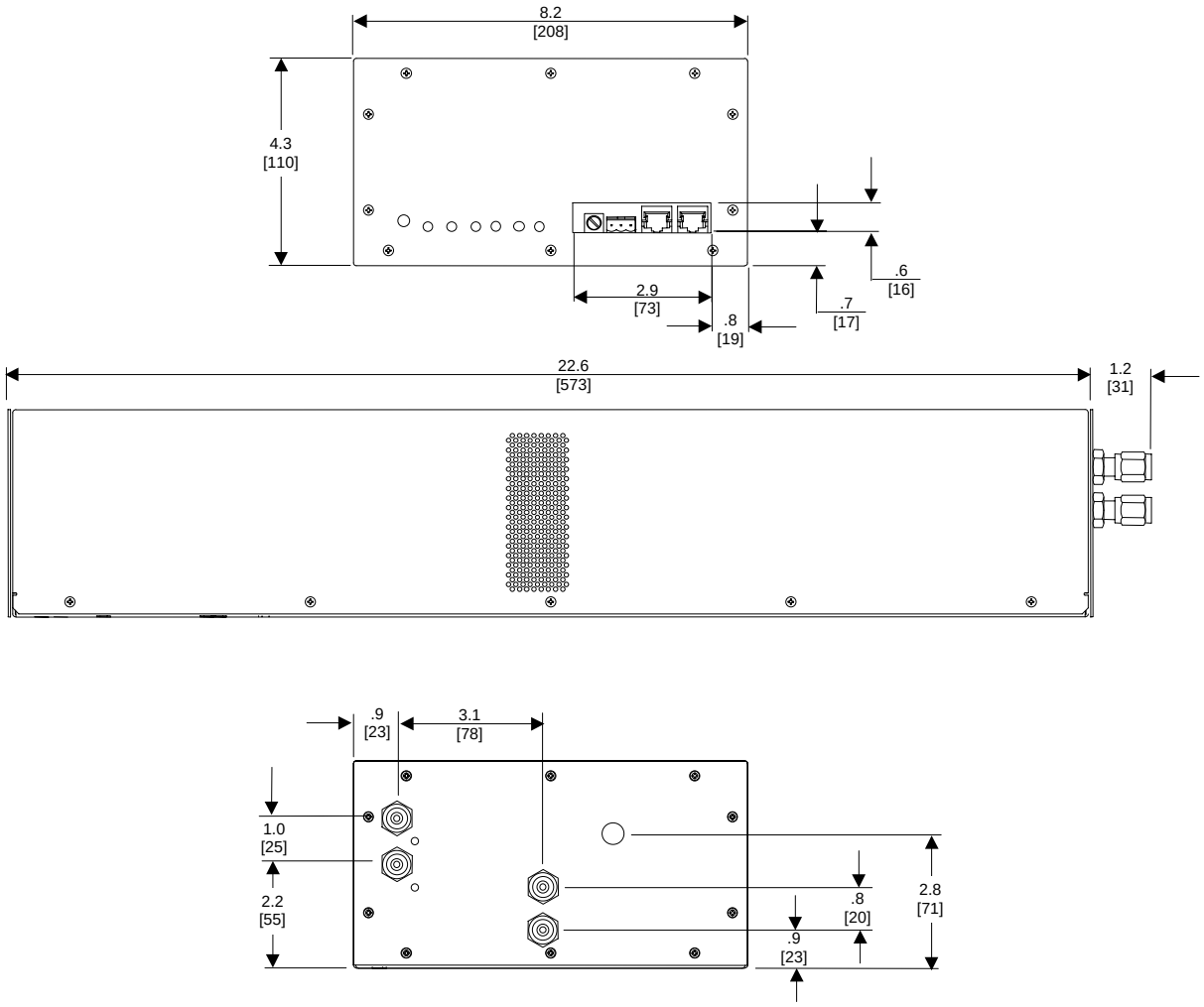


FIGURE 2-1. FID 2 OUTLINE AND MOUNTING DIMENSIONS

2.4.1 CONNECTIONS

Refer to Figure 2-2. Connect inlet and outlet lines for sample, burner fuel and air, exhaust, and bypass to appropriately labeled fittings on the rear panel. All connections are 1/4-inch ferrule-type compression fittings. Burner exhaust and bypass must be vented at atmospheric pressure to a non-classified location in accordance with ANSI/NFPA-496.

2.4.2 GAS SPECIFICATIONS

Fuel Gas — Standard analysis usually requires mixed fuel, i.e., 40% (±2 %) hydrogen and 60% helium. H_2/He mixed fuel is recommended over H_2/N_2 fuel because of better linearity in concentration output. Such blends are supplied by many gas vendors specifically for this use, with a guaranteed maximum total hydrocarbon content of 0.5 ppm, measured as methane. This specification should be used when obtaining these mixtures.

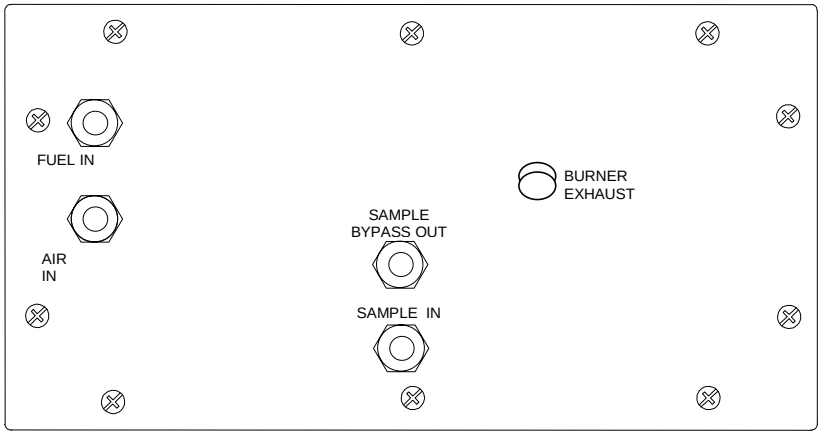


FIGURE 2-2. FID 2 REAR PANEL

Note:

The Analyzer fuel inlet restrictor fitting and Detector fuel gas capillary inlet are marked with white dots for pure hydrogen fuel applications and with green dots for mixed fuel applications.

Note:

Some applications require the use of 100% hydrogen fuel. When using this option, always ensure that sample gas pressure (4 to 5 psig) is present when fuel flow is present. Otherwise, the flame tip may be damaged.

Burner Air — In order to ensure a low background signal, hydrocarbon free grade air with less than 1 ppm maximum total hydrocarbon content is highly recommended. An alternative source for burner air and zero gas (see CALIBRATION GASES below) is a combination diaphragm pump and heated palladium catalyst. This process continuously removes moderate amounts of hydrocarbons and carbon monoxide from ambient air.

Calibration Gases — Calibration method and gases depends on the type of fuel gas used, the operating range, and the desired measurement accuracy. In all methods, zero and span gases are used, and are introduced through the sample inlet at the rear of the module.

Zero Gas — It is recommended that the gas should have a composition as close to the background composition of the sample as possible.

Span Gas — Span gas consists of a specified concentration of methane and other hydrocarbons in a background gas such as nitrogen.

Sample Gas — Sample gas must be nonflammable (below 100% of the sample's LEL).

Flow Rate — The sample flow rate must be between 0.5 L/min. and 2 L/min.

Pressure/Filtration — See Table 2-1 for input pressure specifications. Noncompliance with these specifications could cause over-pressure damage to the module.

GAS SUPPLY	EXTERNAL PRESSURE	INTERNAL PRESSURE
FUEL	50 – 55 psig 1035 - 2070 hPa	5 psig 345 hPa
BURNER AIR	30 - 40 psig 1380 - 4140 hPa	15 psig 1035 hPa
SAMPLE	5 - 10 psig 345 - 690 hPa	5 psig 345 hPa

TABLE 2-1. GAS SUPPLY PRESSURES

All internal pressure settings are preset at the factory, but the operator should check for accuracy. ***It is essential that the sample be filtered for particulates down to 0.1 microns***. A suitable filter is the Balston type 95S6 with 0.1 micron filter element. It should normally be replaced on a two week schedule, depending on the sample.

Leak Test — The Analyzer Module is completely tested at the factory for gas leakage. The user is responsible for testing for leakage at the inlet and outlet fittings on the rear panel. The user is also responsible for internal leak testing periodically and if any internal pneumatic components are adjusted or replaced (with a test procedure chosen by the user).

2.5 ELECTRICAL CONNECTIONS

Note

Electrical installation must be in compliance with National Electrical Code (NEC/NFPA 70) and/or any state or local codes.

Two electrical connections are required on the Analyzer Module: POWER and NETWORK. See Figure 2-3. On the Analyzer Module, two NETWORK connectors are available, either of which is appropriate for: 1) interconnection with the Back plane of the Platform or 2) "daisy-chaining" with other NGA 2000 components, or 3) connection to a PC via a suitable LONTALK adapter and software such as the NGA DDE server and client. Connect Analyzer Module POWER to Back plane POWER or external 24 VDC power source.

Connect the network cable to either the NETWORK 1 or NETWORK 2 connection on the Analyzer Module front panel, and the NETWORK connection on the LON I/O module if used with a Platform, or directly to a computer using appropriate LONTALK adapter hardware and software such as the NGA DDE server. Connect the power cable to both the Analyzer Module front panel and to a 24V 5A minimum power supply.

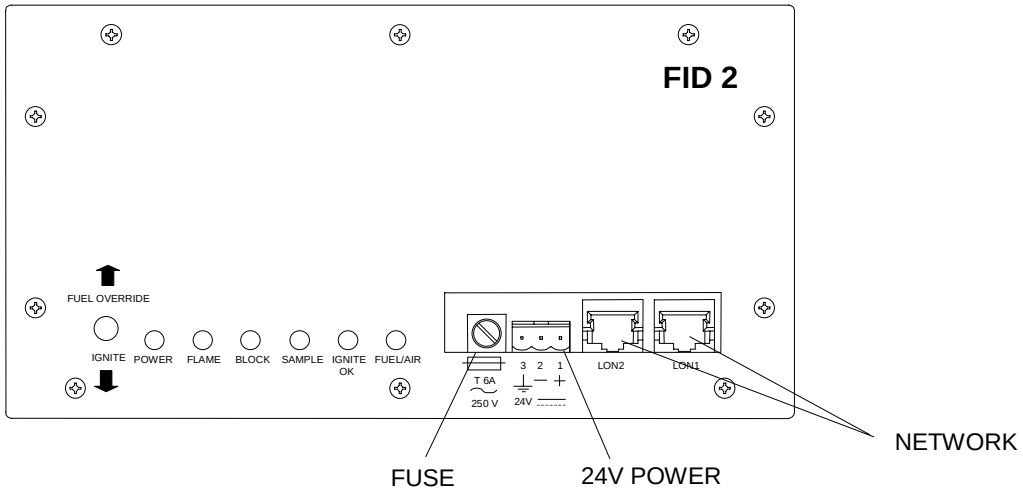


FIGURE 2-3. FID 2 FRONT PANEL

2.6 INSTALLATION GUIDELINES

- Is the Analyzer's Location clean, weather-proofed, non-hazardous, vibration-free, and with a stable ambient temperature?
- Are gas supply cylinders equipped with a clean, hydrocarbon free two stage regulator and shut off valve?
- Are external tubing, regulators, valves, pumps, fittings etc. clean?
- Is the correct fuel type being used?
- Is the THC content of the supply gases compatible with the analysis range?
- Are the burner exhaust and bypass vented to atmospheric pressure? Is the vent pressure constant?
- Is the burner exhaust tube slanted down a minimum of 6 degrees from horizontal?
- Have all the external gas connections been leaked checked?
- Has the dead volume for external sample and fuel lines been minimized?
- Has clean stainless steel tubing been used for fuel and sample lines?
- Is a suitable 0.1 micron filter used in the sample line?
- Is the sample line and filter heated?

NOTES

3 STARTUP AND OPERATION

3.1 OVERVIEW

Prior to initial startup, the user should leak test the module as outlined in Section 2.

For the remainder of this section, Analyzer Module interconnection with a Platform or some interfacing component will be assumed. Display and Keypad information refers to use of this module with the Platform.

(For a complete description of Platform Front Panel controls and indicators, see the Platform instruction manual.)

(For detailed information about the software operation of this analyzer, see Appendix E and F, and the NGA Reference manual.)

3.2 DISPLAYS

Three kinds of Display screens are available to the user:

- Run Mode
- Menu
- Help

3.2.1 RUN MODE DISPLAY

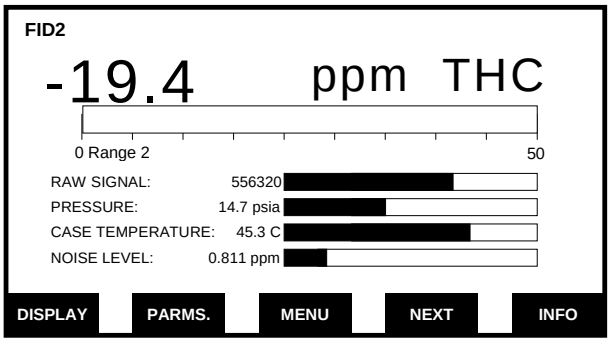


FIGURE 3-1. RUN MODE DISPLAY

The Run Mode is the normal mode of operation. In this mode, the display will show the gas measurement of the selected analyzer or subnode(the Control Module may be connected to many analyzers at once, but only one may be displayed at a time as shown), the component of interest, user-selectable (up to four) secondary variables, the current operations of the softkeys, and a graphic bar representing the displayed concentration as a percent of fullscale.

It is also possible to show up to five analyzers or subnodes on the screen at once, each analyzer having its own line on the display.

3.2.2 MENU DISPLAYS

The following is a brief description of the menus shown on the Platform Control Module as they apply to the FID 2 analyzer. Much more detail is available in the Platform manual as well as in the NGA Reference manual.

The first menu shown for any of the subnodes is as follows:

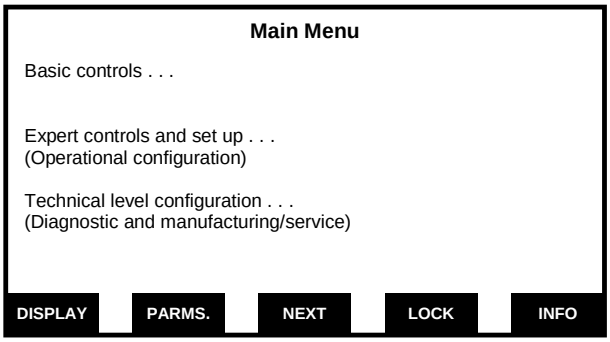


FIGURE 3-2. MAIN MENU

The Main Menu is subdivided into three levels of control based generally on which personnel is likely to use it: *Basic Controls* - Operators, *Expert Controls and set up* - System Engineers, and *Technical level configuration* - Analyzer technicians. Many layers of the menu structure are described at appropriate places throughout this manual.

From the Run Mode display, press the MENUS softkey to gain access to the Main Menu.

The Basic controls menu is as follows:

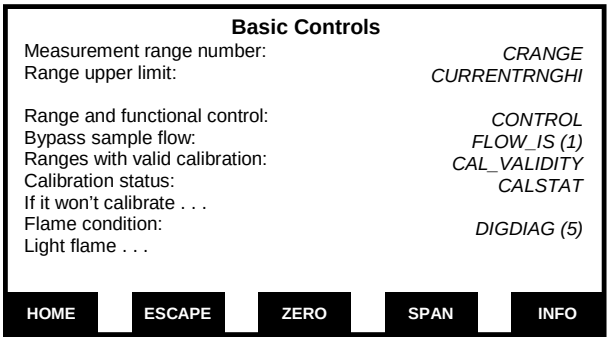


FIGURE 3-3. BASIC CONTROLS MENU

This menu allows the user to change the range for all subnodes, to control the operation of the GC (single shot or continuous operation) and to see its current operational status, to allow remote control of the range change, and allows links to other menus to light the flame, zero and span the analyzer.

Note

In the menu figure above, the italicized/capital words are the names of the network variables whose values are in fact shown on the screen.

The Expert controls menu is as follows:

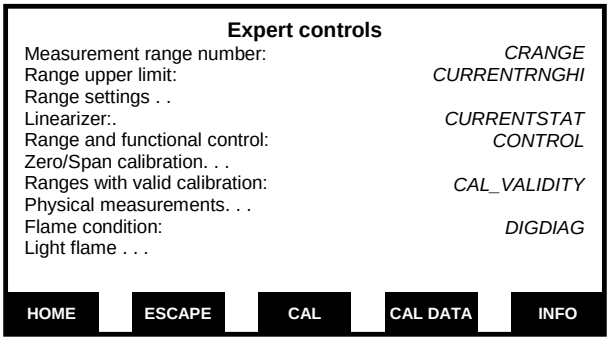


FIGURE 3-4. EXPERT CONTROLS MENU

This menu is almost the same as the *Basic controls* menu but with the addition of a few extra links.

The analyzer may be configured through the *Analyzer set up* menu, under *Expert controls and set up*.

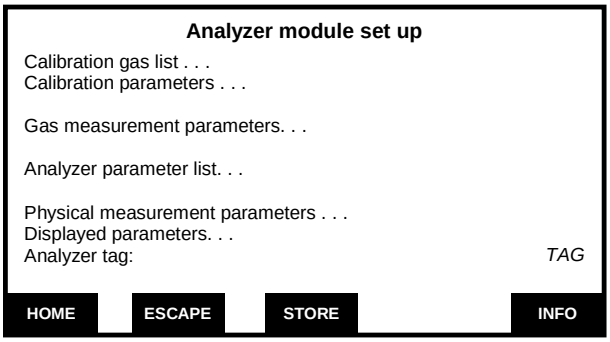


FIGURE 3-5. ANALYZER MODULE SETUP MENU

This menu contains links to many other menus used to configure the operation of the analyzer.

3.2.3 HELP DISPLAYS

A typical help menu:

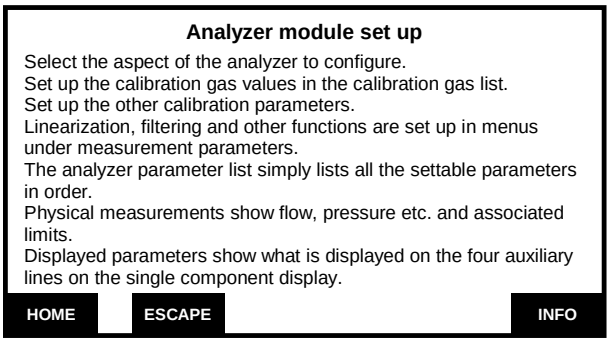


FIGURE 3-6. TYPICAL HELP MENU

3.3 STARTUP PROCEDURE

WARNING: VENTILATION

For safety, the Analyzer Module should be installed in a non-confined, ventilated space. Do not block any of the ventilation holes as they are part of the safety system.

1. Connect supply gases and outlets to/from module.
2. Connect the LON cable(s) and the +24VDC power cable.
3. Turn power ON.
4. Check the LED's. The power green LED should be illuminated. The Flame LED should be OFF. The block LED should be blinking or ON.
5. Allow the network to initialize. Perform any binding of I/O modules required – see the Platform manual for details.
6. Check the general health of the analyzer by reviewing the status of the Self Tests. All "Pass" conditions should be obtained.

   These test results can be found by selecting the following from the *Main menu*: *Technical level configuration*, *Diagnostic menus*, *Analyzer module diagnostics*, *Self test results*. All tested parameters should indicate "Pass."

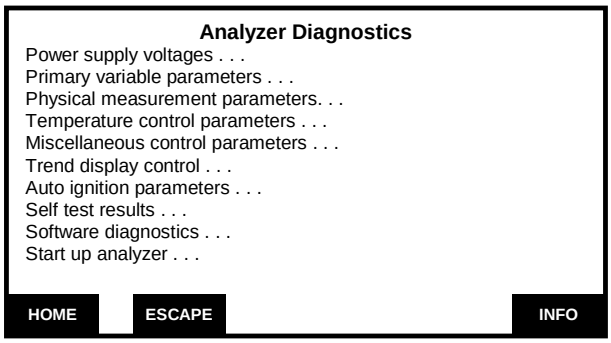


FIGURE 3-7. ANALYZER DIAGNOSTICS MENU

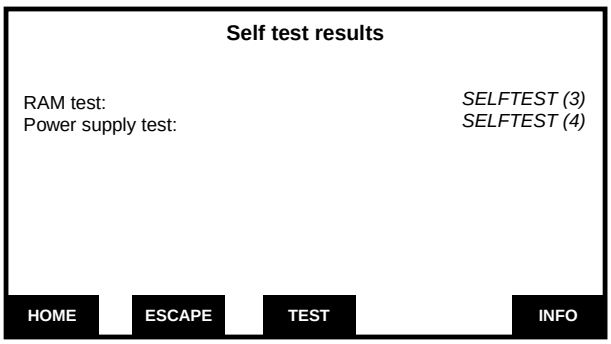


FIGURE 3-8. SELF TEST RESULTS MENU

Descriptions of the tests performed follow:

RAM TEST

Checks the RAM on the Analysis Computer PCB.

POWER SUPPLY TEST

Verifies that all internal DC voltages are within the required tolerances.

The self-test can be repeated at any time by activating the TEST softkey in the *Self Test Results* menu.

7. Introduce the remaining supply gases. Perform leak check. (See Specifications page(s) in the Preface section of this manual)

8. Set and verify the internal gas pressures.

9. Allow the block to warm up to 50°C, approximately 30 minutes.

10. Note the six LED's on the front panel of the Analyzer Module. They provide necessary information for proper ignition procedure. The LED's, when illuminated, denote the following information:

- Power - unit powered on
- Flame - Flame on. If the module is trying to light the flame, with fuel flowing but no flame detected, the LED will flash.
- Block - Continuous illumination implies the block temperature is within 5% of its operating temperature setpoint ; otherwise the LED will blink. If the oven temperature is too high the LED blinks at double speed.
- Sample - Sample pressure is within ±15% capillary requirement.
- Ignite OK - The block temperature is ≥ 50°C allowing proper ignition to occur.
- Fuel/Air - Proper fuel and air conditions exist to support a flame. Fuel pressure is between 400 and 675 hPa. Air pressure is between 800 and 1200 hPa. The ratio of fuel/air is between 35% and 65%. This light will not come on until successful ignition.

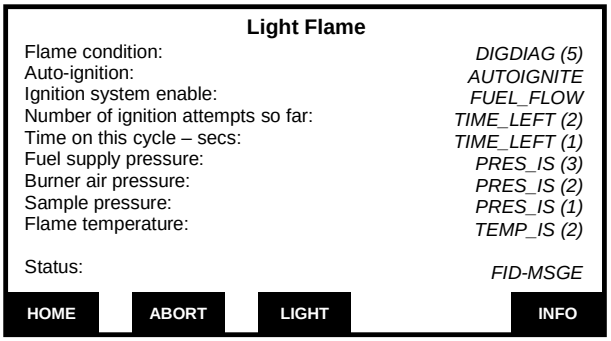


FIGURE 3-9. LIGHT FLAME MENU

11. Auto-ignite the flame. The Flame LED should then be continuously illuminated when the flame is successfully lit.

    Auto-ignition provides fuel override and three attempted ignitions (default setting), if necessary.

    Before ignition and operation, Fuel Flow must be set to ON in "Light Flame" display screen under *Basic Controls*.

    The front panel ignition switch must be manipulated in the following ways:

    a. Press up and hold for 30 seconds. This puts the system into the enriched mode, with lower air flow.
    b. Press down to turn on the burner glow plug for up to 10 seconds.
    c. Repeat as necessary (if fuel and air sources are farther away than 10 feet, several more attempts may be necessary).
       Flame on is defined as true when the flame temperature is greater than the block temperature by the amount contained in the variable FLAME_DELTA.
    d. If the flame has been lit, but the flame temperature increases slowly, perform the following steps:
       1) After igniting flame, wait for 2 seconds.
       2) Press switch down momentarily.
       3) Repeat release switch, wait and press down steps as necessary.

12. Check and re-adjust the internal pressures if required. The Fuel/Air light must be lit for proper operation.

13. The unit is now ready for first binding as described in Section 3.5, and then optimization as described below.

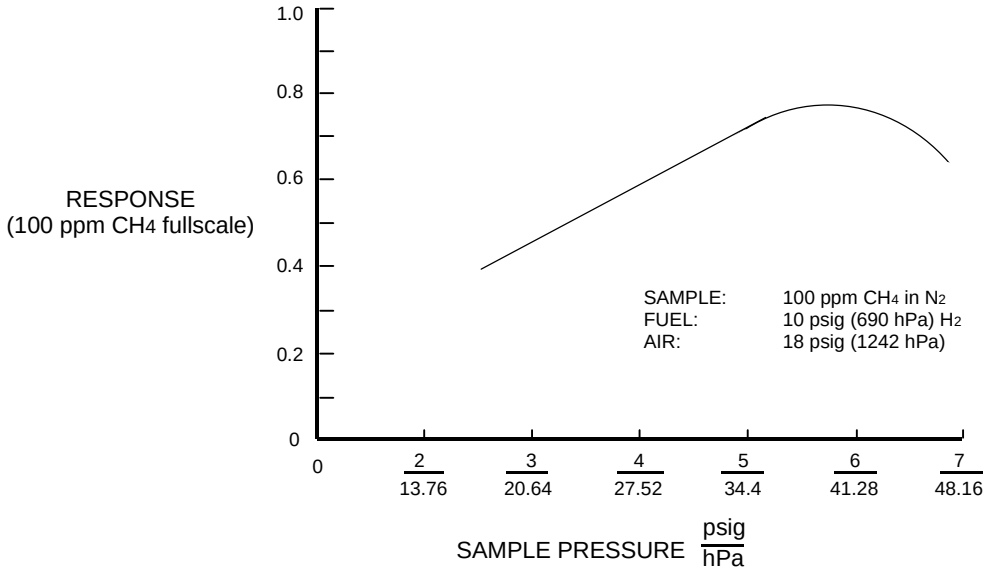


FIGURE 3-10. TYPICAL CURVES OF MODULE RESPONSE VS. PRESSURE SETTING ON SAMPLE PRESSURE REGULATOR

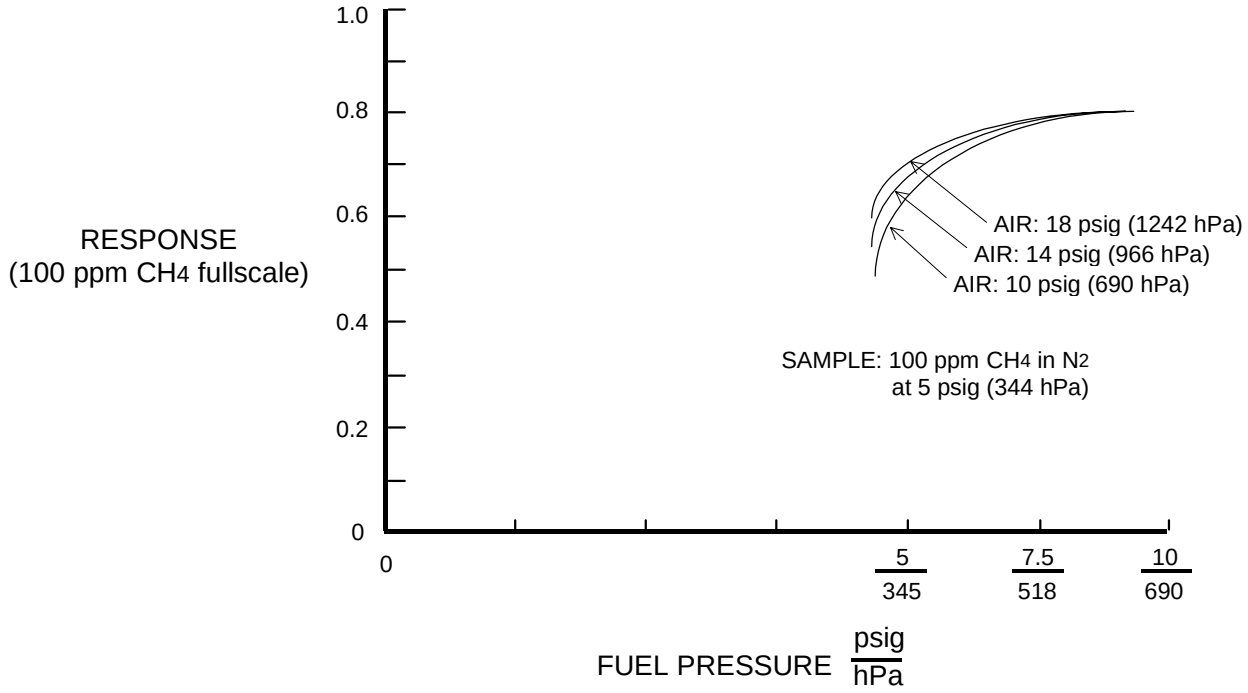


FIGURE 3-11. TYPICAL CURVES OF MODULE RESPONSE VS. PRESSURE SETTING ON FUEL PRESSURE REGULATOR

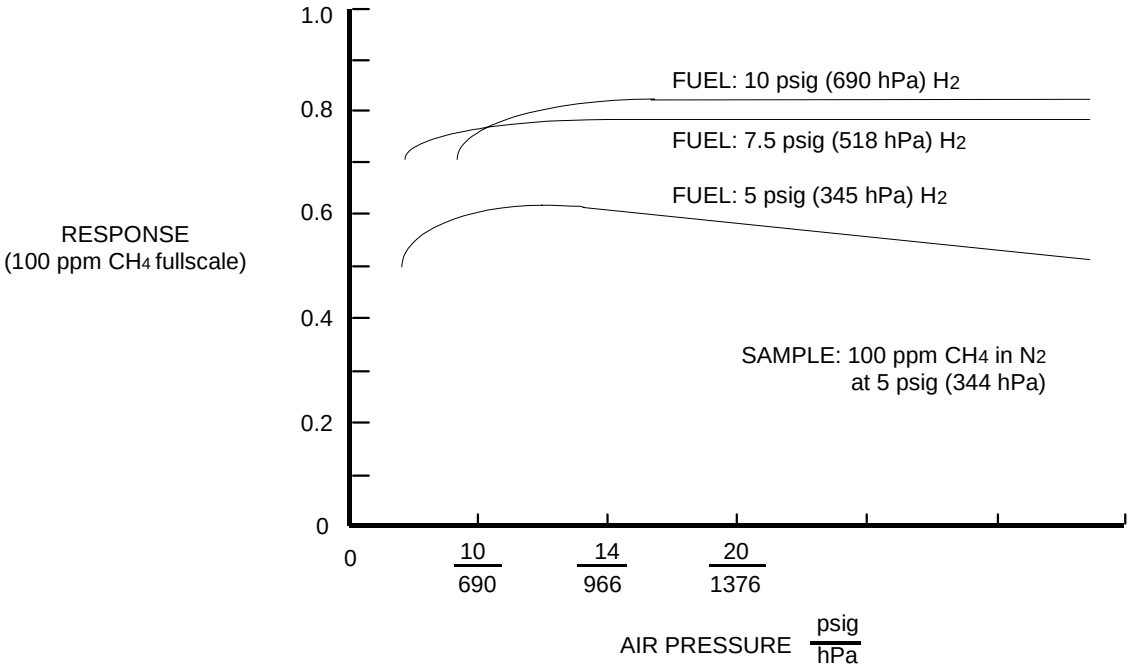


FIGURE 3-12. TYPICAL CURVES OF MODULE RESPONSE VS. PRESSURE SETTING ON AIR PRESSURE REGULATOR

3.4 OPTIMIZATION PROCEDURE

Although the module has been set up for best operation at the factory, settings can change and your application may be different. The following shows how to optimize the operation of the FID 2 for your application.

1. Ignite the flame of the FID 2 using the startup procedure as above.
2. Verify that the mixed fuel supply pressure at the Analyzer's rear panel bulkhead is between 49 and 50 psig.
3. Allow the Analyzer module response to stabilize. Typically allow 1 to 4 hours.
4. Select the desired range to optimize. For best results use a span gas with a concentration of 100 ppm CH_4 or greater. This will minimize the effects of the THC contamination in the fuel and burner air supply.
5. Set the internal sample pressure to the desired operating level. The sample pressure must be kept constant throughout the optimization procedure.
6. Set the internal burner air pressure to between 965 to 1103 hPa-gauge (14 to 16 psig). The burner air pressure must be kept constant throughout the optimization procedure.
7. Set the internal fuel pressure to 345 hPa-gauge (5 psig). Calibrate the instrument as stated below.
8. Introduce the span gas and monitor the reading until it is stable. Increase the internal fuel supply setting in the following sequence: 600 hPa-gauge (8.7 psig), 625 hPa-gauge (9.1 psig), 650 hPa-gauge (9.4 psig), 675 hPa-gauge (9.8 psig), 700 hPa-gauge (10.1 psig), and 725 hPa-gauge (10.5 psig). Monitor the reading at each fuel pressure setting. Wait at least 2 minutes between fuel setting changes. Record all the readings.
9. Review the readings for each fuel pressure setting. Select the fuel pressure setting that produces a reading that is within 1% from the maximum. For this condition the FID 2 is operating at its optimized plateau.

3.5 BINDING

To achieve full coordination between Analyzer Modules and associated I/O Modules, the user must bind those components together in the *System Set Up* portion of the *Technical Configuration* Menu in software. (See the Platform manual for binding instructions.)

Note

If binding is attempted after ignition, the flame may be extinguished. If this occurs, it must be re-ignited.

3.6 CALIBRATION

See Section 2.4.2 for a description of the method for choosing calibration zero and span gases.

Menus used for calibration include the following:

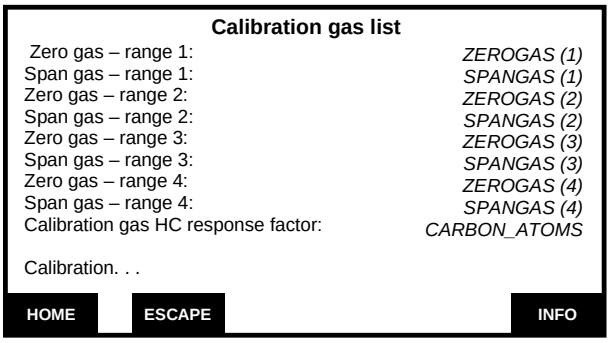


FIGURE 3-13. TYPICAL CALIBRATION GAS LIST MENU

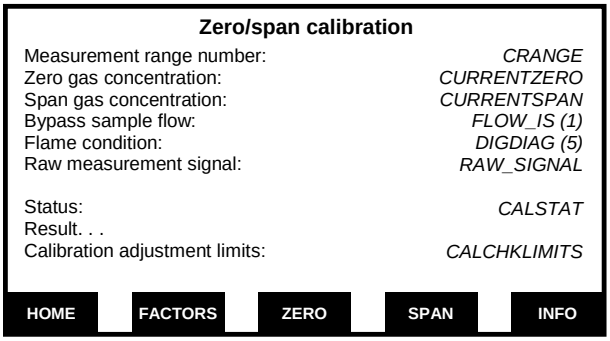


FIGURE 3-14. ZERO AND SPAN CALIBRATION MENU

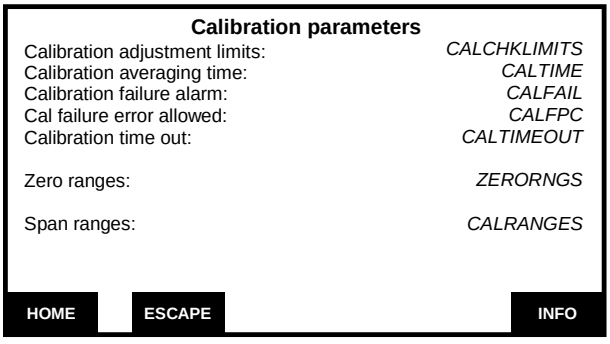


FIGURE 3-15. CALIBRATION PARAMETERS MENU

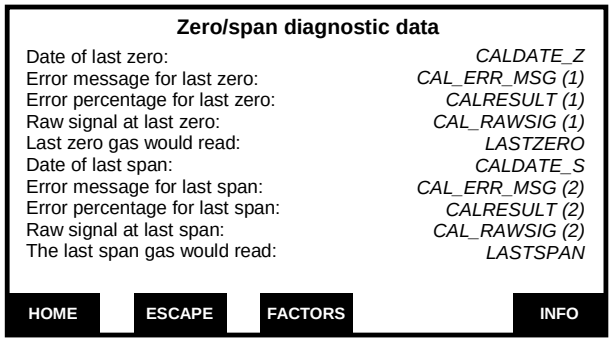


FIGURE 3-16. ZERO/SPAN DIAGNOSTIC DATA

To calibrate the Analyzer Module, introduce span gas into the SAMPLE INLET, and do the following:

1. If more than one Analyzer Module is functional and the split Run Mode display is shown, press the **DISPLAY** softkey until the desired Analyzer's Run Mode display is acquired.
2. Press the **MENUS** softkey to enter the *Main Menu*.
3. Verify the fuel type in the *Miscellaneous Control Parameters* menu (under the Technical Configuration menu structure, select the following from the *Main Menu: Diagnostic menus*, *Analyzer Module Diagnostics* and then *Miscellaneous Control Parameters*).
4. In the *Calibration Gas List* menu (from the *Main Menu*, select *Expert Controls and Setup*, *Analyzer Module Setup*, then *Calibration Gas List*), enter necessary data, including the Calibration Gas HC Response Factor. Common HC factors are: methane (CH_4), 1.0, ethane (C_2H_6), 1.90, propane (C_3H_8), 3.00. These factors not only compensate the reading, but are used to select the proper preamp sense resistor
5. Note that you can go straight to the zero and span calibration screens from here.
6. Press **HOME** to re-enter the *Main Menu*, enter the *Basic Controls* menu, introduce zero gas and allow its response to stabilize, press the **ZERO** softkey to enter the *Analyzer Zero* menu, press **ZERO** again and wait.
7. Press the left arrow key to return to the previous menu, change ranges to the next range, and repeat the zero.
8. Press the **SPAN** softkey to enter the *Analyzer Span* menu, introduce span gas and allow its response to stabilize, press **SPAN** again and wait.
9. Press the **HOME** softkey to re-enter the *Main Menu*.
10. Press the **DISPLAY** softkey for the *Run Mode* display.

3.7 CALIBRATION DETAILS

The range change resistor in the preamp has some effect on the way the spans work. In most NGA analyzers it is possible to make them zero and span all ranges together or separately. If this option is selected, the analyzer attempts to determine if a zero or span is appropriate using the supplied zero and span gases, and if the gases are suitable it will go ahead and zero or span as many ranges as it can. The FID 2 however may switch gains between ranges, and if so it will not be able to zero or span the ranges on the other side of the switching point.

The switching point is determined by a number of factors, including the gas response factor, the sample pressure, the type of fuel and the capillary used. In general it will occur at about 600ppm of methane on a low range instrument. This means that if the ranges are set at 10, 100, 1000, 5000, the analyzer will be able to span the lower two, or the higher two at once, but not all four.

Generally, it is best to operate the analyzer on a single range and calibrate that, or to calibrate the ranges individually.

If the user is unable to calibrate the Analyzer Module (i.e., when ZERO or SPAN is initiated, nothing happens), several possible solutions may be tried. One solution relates to the use of an incorrect gas for zeroing or spanning (e.g., using a high concentration gas to zero or a zero gas to span the Analyzer Module). Simply recalibrating with the appropriate gas(es) may not correct the problem because the ZERO OFFSET or SPAN FACTOR has been set to an extreme value in the process.

To remedy the problem, do the following:

1. Verify that correct zero and span calibration gases are being used properly. If so, attempt to recalibrate according to instructions at the beginning of the previous section, ensuring that case temperature and displayed measurement reading are stable before initiating the calibration routine. If incorrect gases were used in the initial, failed calibration, skip to Step 2.
2. Make the following selections from the *Main Menu: Expert Controls and Setup, Analyzer Module Setup, then Calibration Parameters. Disable Calibration Adjustment Limits.*
3. Recalibrate the analyzer module according to instructions at the beginning of the previous section, ensuring that case temperature and displayed measurement reading are stable before initiating the calibration routine.
4. Enable *Calibration Adjustment Limits* in the *Calibration Parameters* menu.

For further information and troubleshooting tips, refer to the NGA Reference Manual.

3.8 ROUTINE OPERATION

After binding and calibration, proceed as follows:

Supply sample gas to the SAMPLE INLET. Adjust external flow controller or throttle valve so that flow discharged from the BYPASS outlet is between 0.5 and 1.0 L/min. The reading on the SAMPLE pressure gauge should be the same as that used during adjustment of the span control. Adjust, if necessary.

Adjust the Range Number setting.

If maximum sensitivity is required from the FID 2 Analyzer Module, use an optimum combination of settings on the SAMPLE, FUEL, and AIR pressure controllers. Settings must be determined experimentally, but the curves in Figures 3-7, 3-8 and 3-9 may be used as guides for the FID 2 optimization procedure above.

The Analyzer Module will not allow the user to increase the upper limit of a range beyond the "maximum range" software setting. To change the "maximum range" value, select the following from the *Main Menu: Technical Configuration Menu, Service Menus, Manufacturing Data*, and *Analyzer Manufacturing Data*. Select *Minimum/maximum ranges and tags…* and then *Maximum Range*, and use the arrow keys to scroll the indicated values for each applicable measurement. The same applies for *Minimum Range* settings.

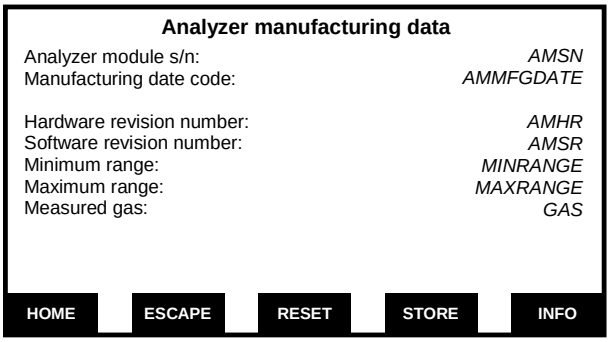


FIGURE 3-17. ANALYZER MANUFACTURING DATA MENU

During shutdown, always turn off fuel gas first, then the air and sample gases. The flame can also be turned off by setting Ignition System Enable to "Off" in the *Light Flame* menu (under *Basic Controls*). Subsequently, remember to set Ignition System Enable to "On" before attempting to ignite the flame.

After initial startup, or startup following a prolonged shutdown, the Analyzer Module requires about one day's continuous operation to stabilize. For several days afterwards, calibrate daily. The frequency of subsequent calibrations can be reduced as experience dictates, consistent with the accuracy requirements of the particular application.

3.9 SHUT DOWN PROCEDURE

If the FID 2 is to be left in the powered down state for any length of time greater than a few hours, it is important that the flame tower be dried out before it cools off. This is to avoid condensation causing corrosion. If the sample contains halogenated compounds this is even more important.

Flush the flame tower with burner air for around an hour after the flame has been turned off. Simply leave the burner air flowing. When no evidence of condensation can be seen in the exhaust tubing, it is safe to switch off the FID 2 power.

If this precaution is not taken, corrosion can occur making it hard or impossible to light the flame.

3.10 SAFETY SYSTEM

The FID 2 Analyzer Module safety system is entirely passive. The pneumatic section of the analyzer is designed to be intrinsically safe, except for the flame tower itself which is designed to be explosion proof. Intrinsic safety design ensures that any energy released in the hazardous area (the pneumatic section) will not be enough to ignite any hydrogen that may have leaked. This is achieved by limiting the voltage and the current in all the circuitry that enters this area. **It is therefore essential that NO modifications are done to the circuit boards**. Any repairs should be performed at the factory where the correct components will be used.

The flame tower is designed to be explosion proof. This is achieved by careful control of the spacing and clearances of the assembly, and the presence of the various flow restrictive devices and the outlet flame arrestor. **It is essential that no changes be made to this device that can impact any of these clearances, and thus that any repairs of the device are such as to maintain its designed clearances**. It is recommended that any repairs of the flame tower be performed in the factory or at other authorized Rosemount service centers.

A temperature safety system activates when the burner flame temperature exceeds 225°C for over 60 seconds. This will shut off the fuel and display a message on the ***light flame menu*** screen. After cooling to below 225°C, the unit can be re-ignited normally. ***Verify that the proper fuel is being used. Do not use H_2 in a unit configured for mixed fuel.***

Since the proper methane – non-methane process should be run under 200°C, you should not experience this failure mode. If it occurs, contact Rosemount Analytical factory service.

3.11 ALARM INDICATIONS

NGA Analyzers from version 2.3 onwards can also report specific alarm conditions through the I/O Modules. The FID 2 Module (at version 3.2 at time of writing) is capable of reporting a flame out condition and a valve failure as specific alarm indications.

The specific alarms are shown in Table 3-1.

DISPLAY MESSAGE	DESCRIPTION	TYPE
NORMAL	No problem found	
MAINTENANCE REQUEST	Warning alarm noted	Warning
FAILURE	Failure alarm noted	Failure
CAL. IN PROGRESS	Performing a zero or span calibration	
SPAN IN PROGRESS	Performing a span calibration	
ZERO FAILED	The latest zero calibration failed	Warning
SPAN FAILED	The latest span calibration failed	Warning
RANGE OVERFLOW	The reading is higher than the current range upper limit	Warning
RANGE UNDERFLOW	The reading is lower than the next range down's upper limit	
FLOW TOO LOW	Sample pressure is below lower limit	Warning
FLOW TOO HIGH	Sample pressure is above upper limit	Warning
RANGE 1, 2, 3, 4	Indicates current range	
FLAME OUT	Flame is off	Warning
FUEL SHUTOFF	Fuel is shut off due to flame over 225°C. This is not a normal operating condition.	Action

TABLE 3-1. FID 2 ANALYZER MODULE ALARMS

3.12 CONFIGURATION STORAGE

The FID 2 analyzer module allows you to store a complete set of configuration variables once the unit has been set up to your satisfaction. This is in addition to the manufacturing variables and the so-called "history" variables already provided by earlier NGA analyzers.

If the configuration is damaged in some way it is possible to press a single softkey and replace the damaged variables with those from the stored set.

Storing the variables can be done by entering the *Expert controls and set up* menu, and pressing the **STORE** button. This leads to an "Are you sure?" menu, giving you a

chance to change your mind. If you want to store the variables, press the **STORE** button in this menu. To restore them all from the stored values, press **RESTORE.**

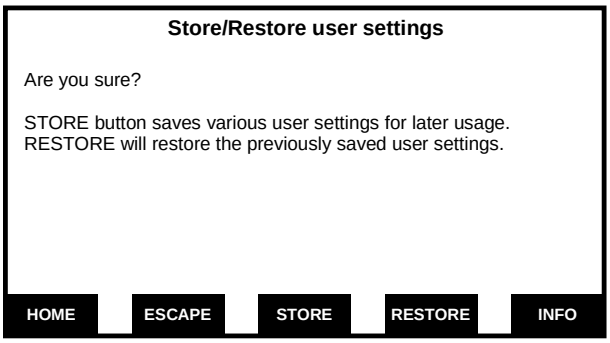


FIGURE 3-18. STORE/RESTORE USER SETTINGS MENU

There is another set of stored variables (just as complete as this set) accessed through the manufacturing data menu (under *Technical set up, Service menus, Manufacturing data, Analyzer manufacturing data*). Pressing the **STORE** button in this menu leads to a similar "Are you sure?" screen, with the same functionality. This set of variables is intended to store the initial set up as stored at the factory, so be wary of using it.

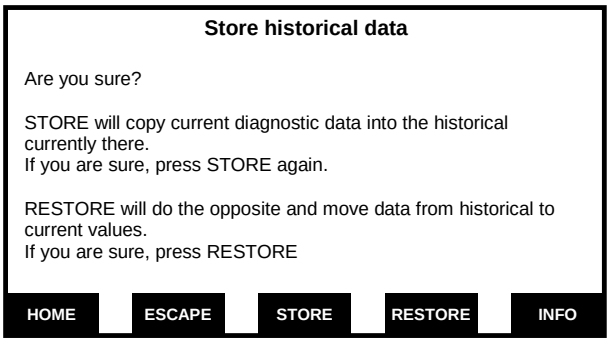


FIGURE 3-19. STORE HISTORICAL DATA MENU

For those who use a computer and the LON network to control this analyzer, the storage variables have the same names as the current variables, but with the addition of "ZZ" at the beginning for the user storage type, and "YY" at the beginning for the factory storage type.

4 MAINTENANCE AND TROUBLESHOOTING

WARNING: ELECTRICAL SHOCK HAZARD

Operate this equipment only when covers are secured. Servicing requires access to live parts which can cause death or serious injury. Refer servicing to qualified personnel.

4.1 GENERAL

When removing the cover of the FID 2 Analyzer Module for service or maintenance, remove only the five screws along the bottom of each side, the seven screws on the front panel and the seven screws on the rear panel. Do not remove the three screws on the bottom of the front panel and rear panel. See Figure 4-2.

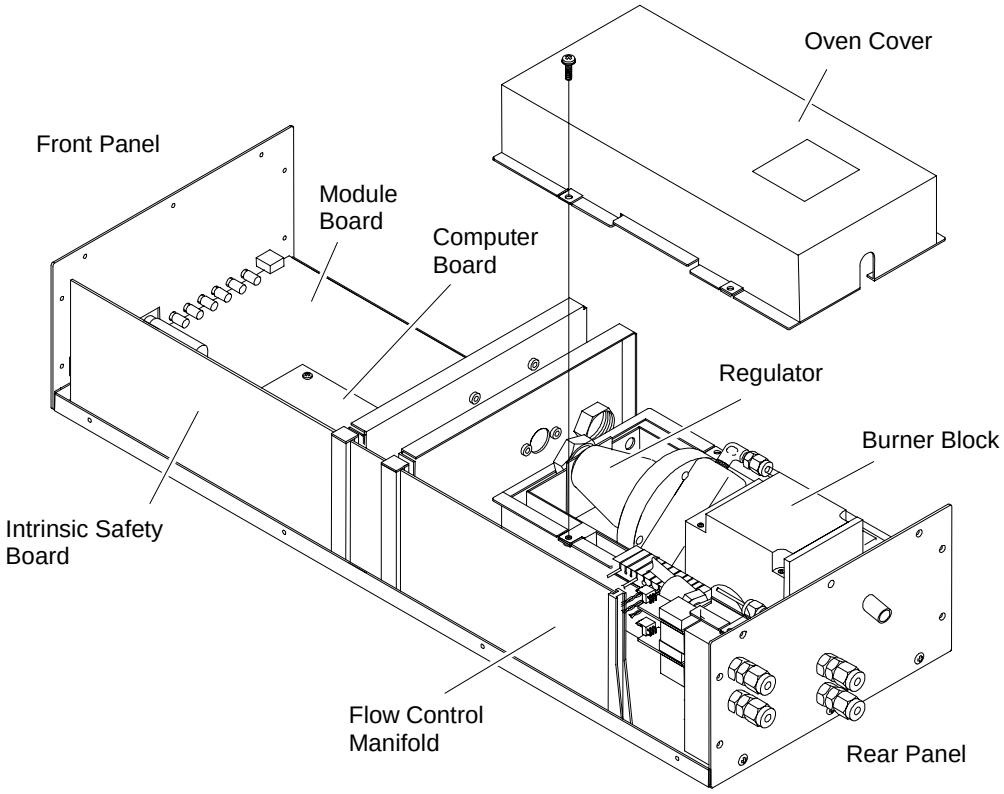


FIGURE 4-1. LOCATIONS OF MAJOR COMPONENTS OF THE FID2

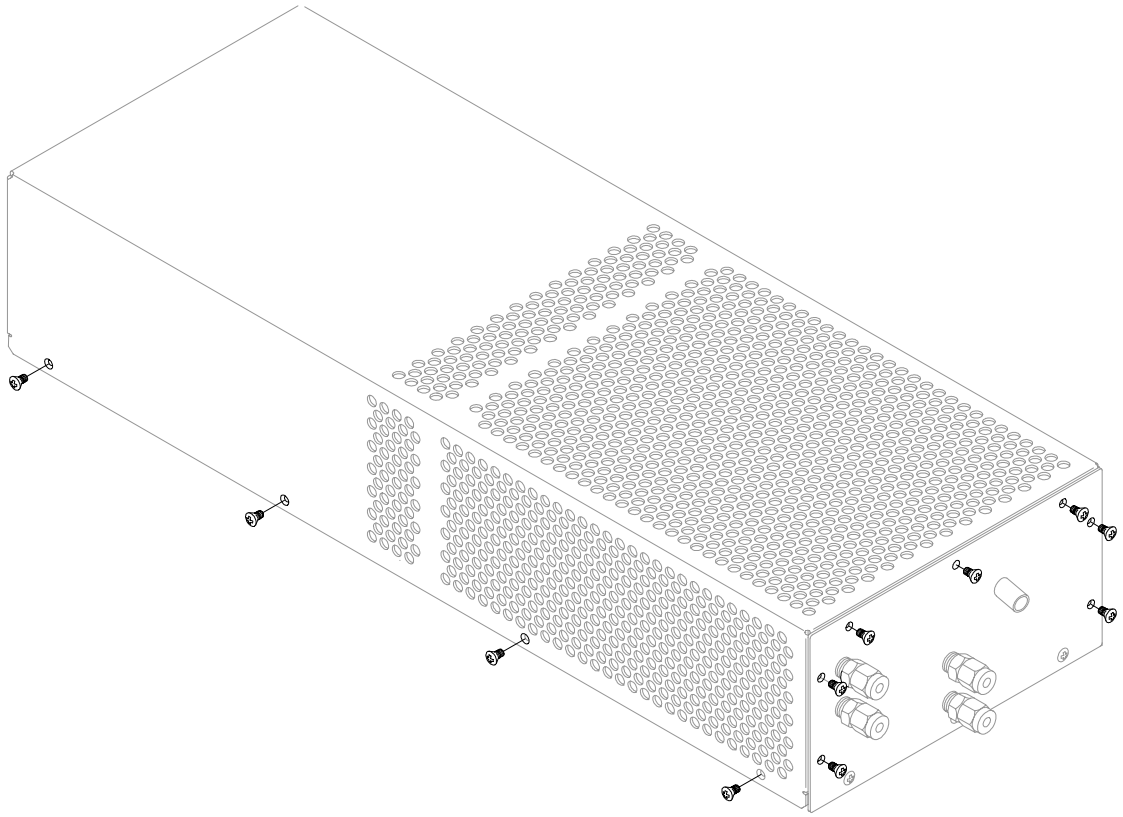


FIGURE 4-2. REMOVAL OF FID2 COVER

4.2 FUSES

The analyzer module has five fuses, all of which are located on the Module Board.

The main power fuse is accessible through the front panel of the instrument. See Figure 4-3. The remaining fuses are located on the solder side of the Module Board (the side facing downward). To access these four fuses, the Module Board must be removed from the analyzer (see Figure 4-4).

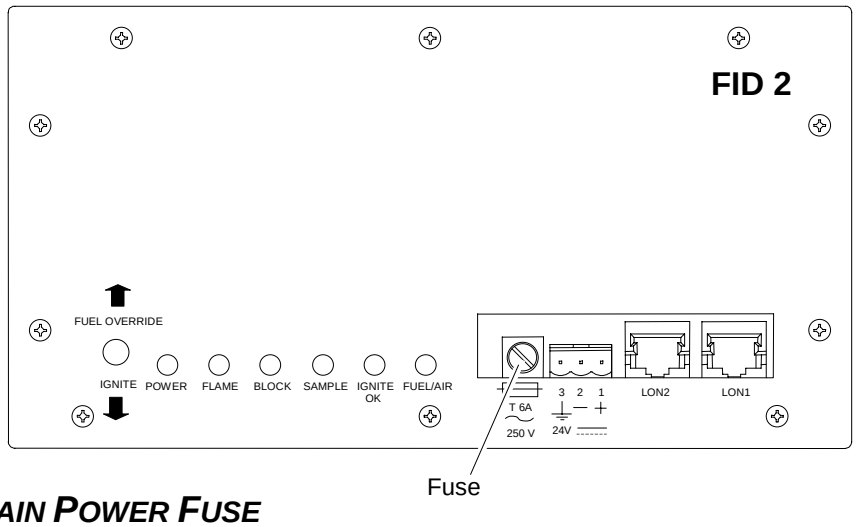


FIGURE 4-3. MAIN POWER FUSE

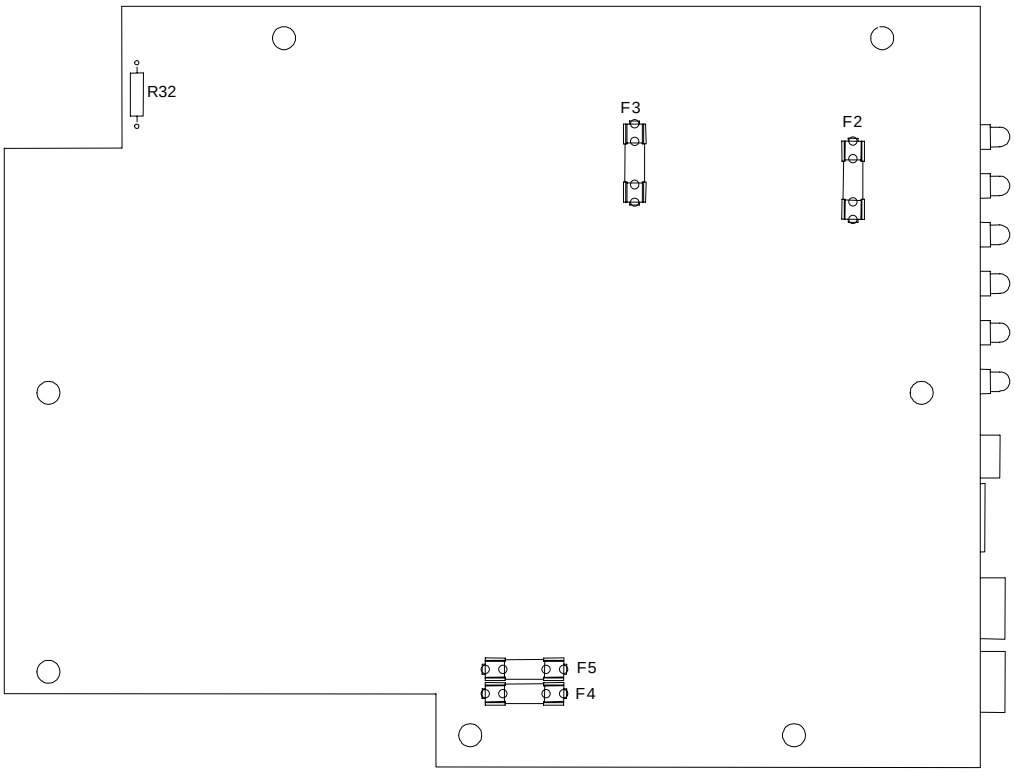


FIGURE 4-4. FUSE LOCATIONS ON MODULE BOARD

4.3 BURNER BLOCK REMOVAL AND INSTALLATION

CAUTION: QUALIFIED PERSONNEL

The burner block assembly should not be adjusted, cleaned or repaired by anyone except factory service personnel. Failure to observe this caution will void agency approvals.

If a burner problem occurs, remove the burner block assembly from the oven and return it to Rosemount Analytical for maintenance and/or repair (see Preface).

CAUTION: BURN HAZARD

The block is temperature controlled at 70°C. Allow unit to cool before touching any of these components.

REMOVAL

Refer to Figures 4-1, 4-2, 4-6, 4-7 and 4-8.

1. Power OFF the module
2. Shut off gas, air and sample gases.
3. Remove the 24 screws securing the module cover. Remove the cover.
4. Remove the four screws securing the oven cover. Remove the oven cover.
5. Disconnect the RTD Cable, 90V Cable, Thermistor Cable, Signal Cable and Ignitor Cable.
6. Disconnect the Air, Fuel and Sample Capillaries.
7. Disconnect the exhaust tube at the oven wall outlet.
8. Loosen the four hex nuts holding the burner block assembly in the oven. Slide the block towards the rear of the module and lift out.

Installation is the reverse of removal.

4.4 BURNER STARTUP AND TROUBLESHOOTING

If burner startup is not achievable, check the following:

1. All supply gas cylinder pressures are within specification (see Specifications in Preface).
2. Correct gases are being supplied to each back panel inlet.
3. Air, not zero gas (if nitrogen), is being supplied to burner.
4. Burner exhaust is being vented to atmospheric pressure, and is not tied to either purge air exhaust or another FID exhaust.
5. Burner exhaust continuously slopes downward until reaching atmospheric pressure vent.
6. *IS* parameters match *WAS* parameters in the Physical Measurement screen; use **MORE** softkey to view all parameters.

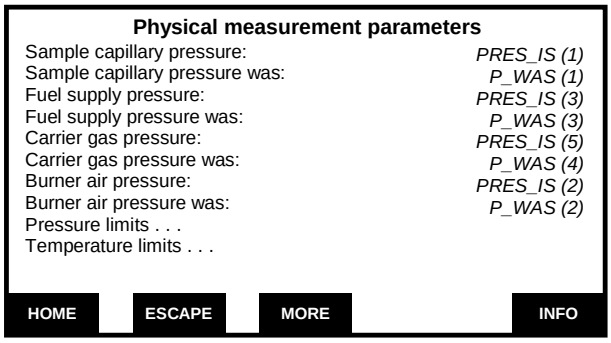


FIGURE 4-5. PHYSICAL MEASUREMENT PARAMETERS MENU

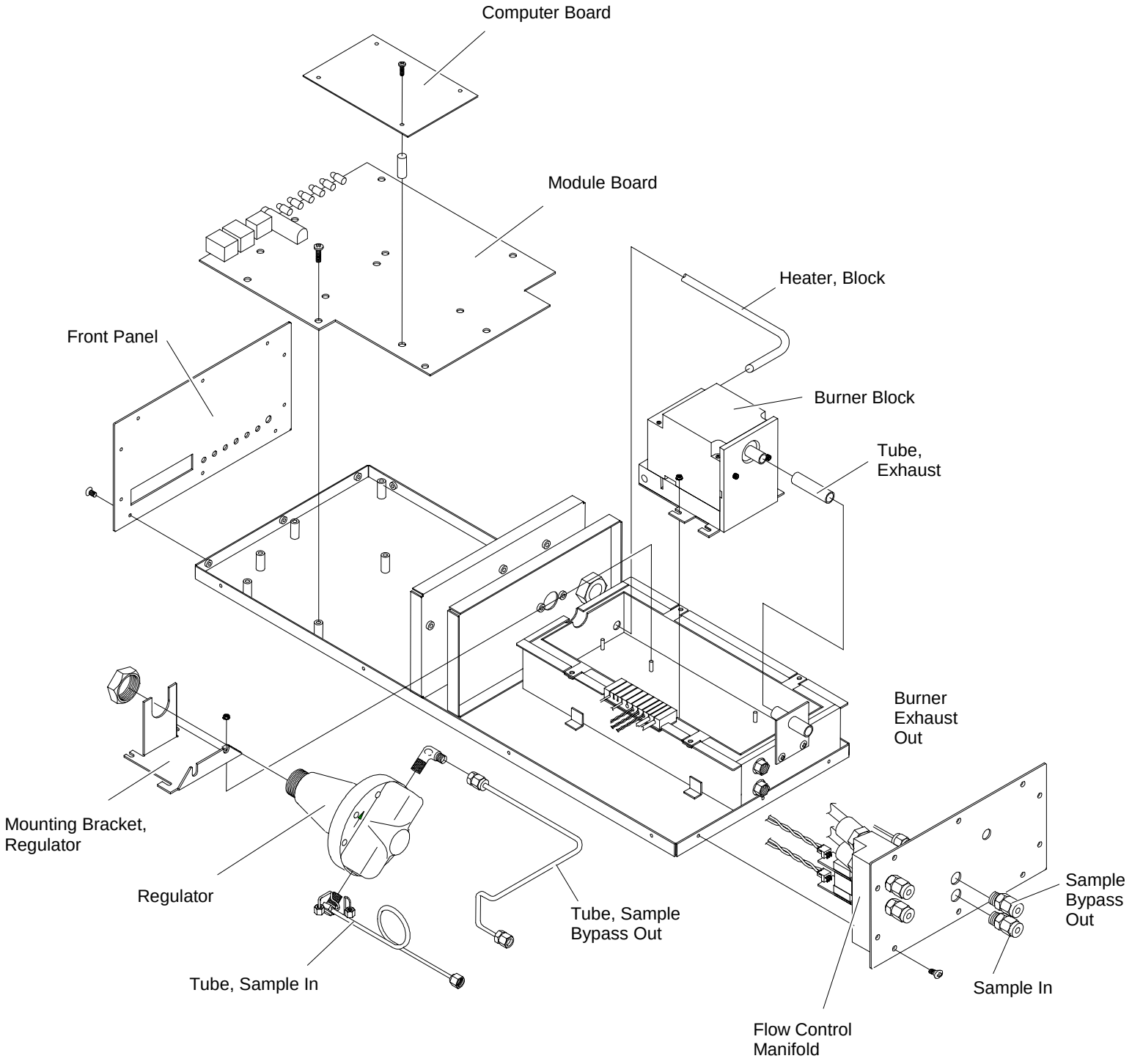
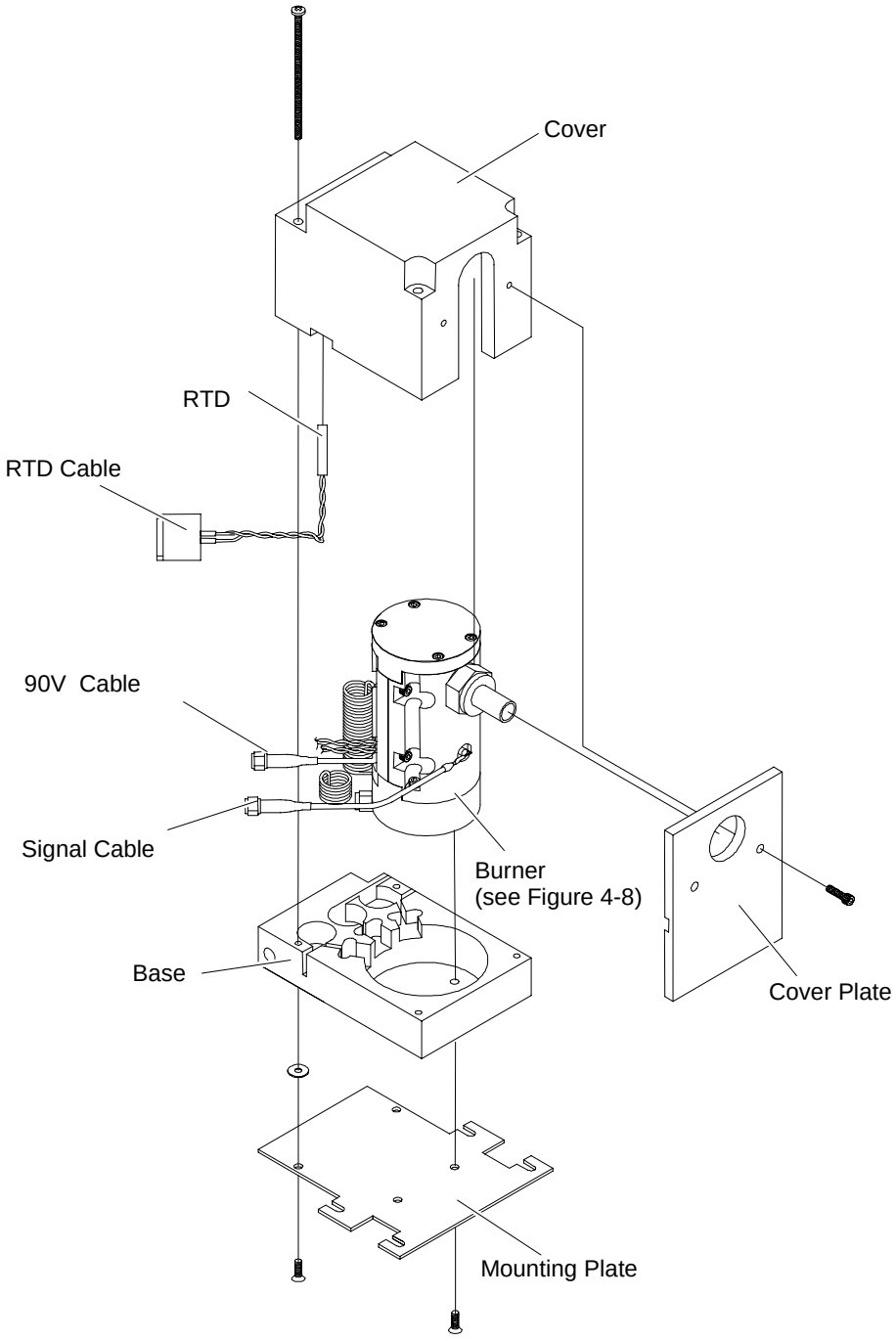
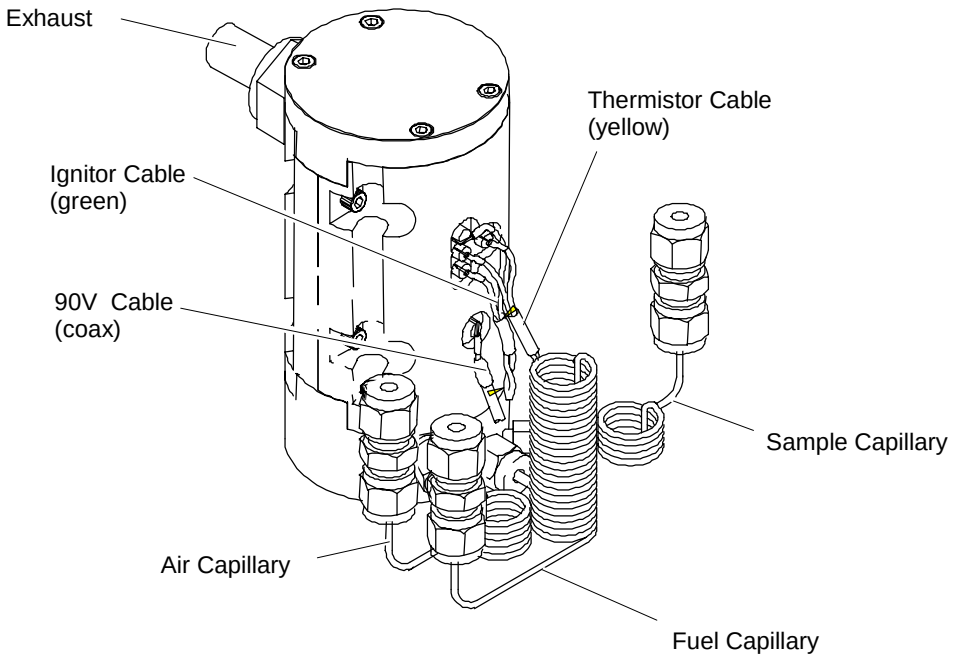


FIGURE 4-6. FID 2 – EXPLODED VIEW



Note: This exploded view of the burner block is for information only. All servicing of the burner block must be performed by Rosemount Analytical.

FIGURE 4-7. BURNER BLOCK – EXPLODED VIEW



Note: This view of the burner is for information only. All servicing of the burner must be performed by Rosemount Analytical.

FIGURE 4-8. BURNER

4.5 MAINTENANCE SCHEDULE

ITEM	EVENT	TIME
REPLACE EXHAUST TUBING	If plastic cracked	Approx. 5 years

TABLE 4-1. MAINTENANCE SCHEDULE

NOTES

5 REPLACEMENT PARTS

5.1 REPLACEMENT PARTS

WARNING: PARTS INTEGRITY

Tampering with or unauthorized substitution of components may adversely affect safety of this product. Use only factory-approved components for repair.

NL658350	Board Assembly, Computer
NL659060	Board Assembly, Module
NL659070	Board Assembly, Intrinsically safe
NL903347	Fuse, 6A (Main Power)
NL903823	Fuse, 4A (F2, F3 on Module Board)
NL903824	Fuse, 5A (F4, F5 on Module Board)
NL659063	Regulator
NL659225	Burner/Block Assembly
NL658144	Heater, Block
NL659043	Flow Control Manifold Assembly

The following components are selectable per application. Consult factory.

Fuel Capillary
Restrictor, Flow
Sample Capillary

NOTES

APPENDIX A. GAS SAFETY FEATURES

A.1 GAS SAFETY FEATURES

The NGA 2000 Flame Ionization Detector Analysis Module is designed to meet international safety standards in accordance with IEC 1010 and other related documents. The gas handling part of the module is designed to be intrinsically safe, other than the flame tower which is explosion proof (Ex"i" and Ex"d" respectively)

The standard module is only equipped to analyze a non-flammable sample, below 100% of the lower flammable limit.

WARNING: POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow limiting restrictor in fuel inlet fitting. Do not remove fuel inlet restrictor. Use the correct fuel flow limiting restrictor for the fuel being used. Do not use 100% hydrogen fuel in a 40% H2/60% He configured Analysis Module. Replace only with factory supplied fitting.

A.2 FUEL GAS OPTION

For the burner fuel gas, the standard analyzer requires 40% hydrogen and 60% helium. Through the selection of the hydrogen fuel option, the analyzer can be equipped to use 100% hydrogen fuel. This factory installed option can be ordered as a matrix item.

The preferred type of fuel depends on the particular application and the characteristics of the sample gas:

For measuring low-level hydrocarbons in ambient air, or in other sample gas with relatively constant oxygen content, 100% hydrogen is preferable. It provides the highest obtainable sensitivity and the maximum stability. Zero drift caused by ambient temperature variations of the fuel cylinder is somewhat lower for 100% hydrogen than for mixed fuel. (With either fuel, it is desirable to maintain cylinder temperature constant.)

For monitoring vehicular exhaust emissions, or other sample gas with varying oxygen content, mixed fuel is preferable; and a hydrogen/helium mixture is more desirable than a hydrogen/nitrogen mixture. With this type of sample, the use of mixed fuel gas minimizes the error introduced by oxygen synergism.

An effective way to reduce the effect of internal oxygen is to dilute it with an inert gas. This might be accomplished by a constant dilution of sample and calibration gases ahead of the burner but it is simpler and more accurate to provide that diluent in the form of premixed fuel. Both nitrogen and helium have been used as a diluent, but helium has proven to be most effective in improving the equality of response to the various species of hydrocarbons.

As indicated earlier the flame output signal is optimum when the ratio of hydrogen flow to inert flow is about 40/60; therefore, this is the chosen composition for hydrogen/helium premixed fuel.

The sample flow is kept low to maximize the dilution effect while still providing adequate sensitivity. The burner air flow is normally about four times the fuel flow, and changes have little effect on signal strength. For a given flow, the signal can be optimized by adjusting the fuel flow rate.

FUEL	l00 cc/min
SAMPLE	10 cc/min
AIR	400 cc/min

TABLE A-1. TYPICAL FLOW RATES WITH PREMIXED FUEL

It is worth noting that with a 40/60 premixed fuel, the above flows amount to 40 cc (8%) hydrogen, 67 cc (13%) inert plus sample and 400 cc (79%) air, which compare closely to the 30 cc (8%) hydrogen, 45 cc (12%) sample and 300 cc (80%) air given earlier for straight hydrogen fuel.

Since the sample flow in the case of mixed fuel operation is only about one-sixth of that with straight hydrogen fuel, it is clear that higher sensitivity is obtained with straight hydrogen fuel operation. However, in any application where the sample contains more than one species of hydrocarbon and/or a varying concentration of oxygen, the mixed fuel operation should be used.

The mixed fuel is recommended, not only for sample containing variable concentrations of oxygen, but also for a specific pure gas application. If straight oxygen samples are used with straight hydrogen fuel, the mixture entering the burner is essentially 100% H2 which tends to produce an unstable signal. The mixed fuel works better. Note that the choice of fuel determines certain analyzer characteristics as tabulated in Table A-2.

ANALYZER CHARACTERISTICS	100% H_2	40% H_2/60% HE
FULLSCALE SENSITIVITY	1 ppm, CH_4 to 2%, CH_4	4 ppm, CH_4 to <5%, CH_4
FUEL CONSUMPTION	35 to 40 cc/min	80 to 100 cc/min
OPERATING RANGE FOR SAMPLE PRESSURE REGULATOR	276 to 345 hPa-gauge (4 to 5 psig)	207 to 345 hPa-gauge (3 to 5 psig)

TABLE A-2. ANALYZER CHARACTERISTICS FOR DIFFERENT FUELS

NOTES

APPENDIX B. ANALYZER SETUP CHECKLIST

B.1 ANALYZER SETUP CHECKLIST

The following checklist is designed to provide a series of steps that should be undertaken during the installation process. The first step in troubleshooting an analyzer system should be to go through this list making sure that all items have been addressed.

B.1.1 SYSTEM SETUP

- ☐ Tags – each subnode
- ☐ Module binding
- ☐ Date and time
- ☐ Security
- ☐ Screen display

B.1.2 ANALYZER MODULE SETUP

GAS MEASUREMENT PARAMETERS

MEASURED GAS

- ☐ Name the gases
- ☐ Set response factors (FID and McFID)

RANGES

- ☐ Set all ranges

LINEARIZATION (N/A FOR MCFID)

- ☐ Edit coefficients
- ☐ Assign curves to ranges
- ☐ Enable curves
- ☐ Mid point check

RESPONSE TIME

- ☐ Set response times
- ☐ Set LON update time

CALIBRATION GASES

- ☐ Set zero and span gas levels for each range

CALIBRATION PARAMETERS

- ☐ Set limit checking
- ☐ Set timing
- ☐ Set how it calibrates on ranges

PHYSICAL MEASUREMENT PARAMETERS - PRESSURES AND FLOWS

- ☐ Set all supporting gas pressures
- ☐ Check sample gas flow
- ☐ Light flame (FID, MCFID)
- ☐ Set gas measurement (CLD)

TECHNICAL CONFIGURATION

- ☐ Check gain
- ☐ Check source current (IR)
- ☐ Check oscillator tune (IR)
- ☐ Check Chromatogram timings (MCFID)

ZERO/SPAN ANALYZER

- ☐ Disable limit checking
- ☐ Flow zero gas, zero the analyzer (optional for MCFID)
- ☐ Flow span gas, span the analyzer
- ☐ Enable limit checking

VERIFY LINEARITY (OPTIONAL)

- ☐ Connect a gas divider or set of calibration gases
- ☐ Verify mid-range readings
- ☐ If necessary, linearize the analyzer.

B.2 AUXILIARY MODULE SETUP

IO PARAMETERS

- Analog output type (voltage/current)
- Calibrate output
- Set output behavior on analyzer error
- Set auto-range change operation
- Set alarm relay behavior

AUTOCALIBRATION PARAMETERS

- Set timing of overall operation
- Set master/slave relationships
- Set valve timing
- Set ranges to be calibrated
- (Single autocal only) Set analog output behavior
- Verify sample system operation

B.3 COMPUTER INTERFACE SETUP

- Install computer hardware
- Verify set up of hardware driver in CONFIG.SYS
- Install DDE server program
- Run the DDE server
- Debug the system if necessary with MAKE_API.EXE
- Set up applications

NOTES

APPENDIX C. USER INTERFACE HELP

C.1 INSTRUCTIONS

This section provides a means of rapidly finding any desired function or configuration factor in the menu system.

The NGA menu system is necessarily complex due to the wide variety of configuration possibilities available with the NGA architecture.

This section consists of a series of titles describing the function or configuration desired, with a series of menu titles that show the path taken to that function.

The menu selections are sometimes abbreviated; Basic Controls is referred to as Basic for example, Expert controls and set up as Expert, and Technical level configuration as Technical.

C.2 MENU ITEMS

ALARM ENABLING

PATH: Technical - Diagnostics - Analyzer module diagnostics - Miscellaneous control parameters

ANALYZER TAG

PATH: Expert - Analyzer set up - Analyzer tag

PATH: Technical - Service - Manufacturing - Analyzer manufacturing data

Note: Set for each analyzer and also for each subnode

AUTO-IGNITION ENABLED

PATH: Basic - Light flame – Autoignition

Note: Automates the light flame sequence, does not light without user prompting though.

BAROMETRIC PRESSURE

PATH: Expert - Analyzer set up - Physical measurement parameters - Pressure limits

Note: Reads data only from other bound analyzers

BAROMETRIC PRESSURE COMPENSATION

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Barometric pressure compensation

Note: Only works if bound in a system with other analyzers

BURNER AIR PRESSURE

PATH: Expert - Analyzer control - Physical measurements

PATH: Expert - Analyzer set up - Physical measurement parameters

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

BURNER AIR PRESSURE ALARM LIMITS

PATH: Expert - Analyzer set up - Physical measurement parameters - Pressure limits

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

CALIBRATION ADJUSTMENT LIMIT

PATH: Expert - Analyzer set up - Calibration parameters - Calibration adjustment limits

Note: Enable to avoid incorrect calibrations

CALIBRATION ERROR ALLOWED

PATH: Expert - Analyzer set up - Calibration parameters - Calibration failure error allowed

CALIBRATION FACTORS

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - NEXT as desired

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Calibration factors – NEXT

CALIBRATION FAILURE ALARM

PATH: Expert - Analyzer set up - Calibration parameters - Calibration failure alarm

Note: Assigns calibration failure to general alarm variable

CALIBRATION FULL SCALE RANGE

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS – NEXT

CALIBRATION PRESSURE

PATH: Expert - Analyzer set up - Calibration gas list - Operational gas response factor

Note: Uses this to determine hardware range changes

CALIBRATION STATUS

PATH: Basic - Calibration status

Note: What the analyzer is doing now

CAPILLARY TYPE

PATH: Technical - Service - Manufacturing - Analyzer module data - Fuel type

DATA STORAGE CONTROL

PATH: Technical - Diagnostics - Analyzer module diagnostics - Trend display control

Note: Stores data for 24 hours, but needs a PC to display it

DISPLAYED PARAMETERS

PATH: Expert - Analyzer set up - Displayed parameters

Note: Also select the source module in Control module menus

DISPLAYED UNITS

PATH: Expert - Analyzer set up - Gas measurement parameters - Units

ENABLE LINEARIZER

PATH: Expert - Analyzer set up - Gas measurement parameters - Linearization parameters

FILTER COEFFICIENTS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Chromatogram filter order

Note: Filters the input to the chromatograph software.

FLAME CONDITION

PATH: Basic - Flame status

PATH: Basic - Light flame - Flame status

Note: Light flame in menu under this

FLAME DIAGNOSTICS

PATH: Basic - Light flame

PATH: Technical - Diagnostics - Analyzer module diagnostics - Auto ignition parameters

Note: Shows pressures, status, etc.

FUEL OVERRIDE DURATION

PATH: Technical - Diagnostics - Analyzer module diagnostics - Auto ignition parameters

FUEL PRESSURE

PATH: Expert - Analyzer control - Physical measurements

PATH: Expert - Analyzer set up - Physical measurement parameters

FUEL PRESSURE ALARM LIMITS

PATH: Expert - Analyzer set up - Physical measurement parameters - Pressure limits

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

FUEL STATUS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Miscellaneous control parameters

FUEL TYPE

PATH: Technical - Diagnostics - Analyzer module diagnostics - Miscellaneous control parameters

GAS RESPONSE FACTOR

PATH: Expert - Analyzer set up - Calibration gas list - Calibration gas response factor

Note: Set to 1 for methane, 3.14 for propane

GAS TYPE

PATH: Technical - Service - Manufacturing - Analyzer module data - Minimum/maximum ranges and tags

Note: Set for each subnode

HEATER CURRENTS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Miscellaneous control parameters

HISTORICAL CALIBRATION FACTORS

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - Range n factors - HISTORY

HISTORICAL PRESSURES AND FLOWS

PATH: Expert - Analyzer set up - Physical measurement parameters (press MORE)

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

Note: Values when analyzer was calibrated at the factory

HYDROCARBON RESPONSE FACTOR

PATH: Expert - Analyzer set up - Chromatogram settings

Note: Set to 1 for methane, 3.14 for propane

IGNITION PARAMETERS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Auto ignition parameters

IN SERVICE DATE

PATH: Technical - Service - Service history - Analyzer module service history

LAST SERVICE DATE

PATH: Technical - Service - Service history - Analyzer module service history

LAST SPAN CALIBRATION DATE

PATH: Technical - Service - Service history - Analyzer module service history

PATH: Expert - Analyzer controls - Zero/span calibration - Result

LAST ZERO CALIBRATION DATE

PATH: Technical - Service - Service history - Analyzer module service history

PATH: Expert - Analyzer controls - Zero/span calibration - Result

LINEARIZER COEFFICIENTS

PATH: Expert - Analyzer set up - Linearizers, ranges and filters- Set coefficients

LINEARIZER CORRECTION

PATH: Expert - Analyzer set up - Linearizers, ranges and filters

LINEARIZER ENABLED

PATH: Expert - Analyzer control - Linearizers, ranges and filters

Note: Shows status

LINEARIZER LIMITS

PATH: Expert - Analyzer set up Linearizers, ranges and filters- Set coefficients

LINEARIZER STATUS

PATH: Expert - Analyzer set up - Linearizers, ranges and filters

LINEARIZER USED

PATH: Expert - Analyzer set up - Linearizers ranges and filters

LON UPDATE RATE

PATH: Expert - Analyzer set up - Linearizers, ranges and filters

MAIN ADC VALUE

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Raw measurement signal

MANUFACTURING DATA – STORING

PATH: Technical - Service - Manufacturing - Analyzer module data - STORE

MANUFACTURING DATE

PATH: Technical - Service - Service history - Analyzer module service history

PATH: Technical - Service - Manufacturing data - Analyzer module data

MANUFACTURING DATE

PATH: Technical - Service - Manufacturing - Analyzer module data - Manufacturing date

MANUFACTURING FACTORS

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - NEXT

MANUFACTURING ZERO/SPAN FACTOR

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - NEXT - HISTORY

METHANE VS. PROPANE

PATH: Expert - Analyzer set up - Calibration gas list - Calibration gas response factor

Note: Set to 1 for methane, 3.14 for propane

NOISE LEVEL

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters

ORIGINAL PRESSURE AND FLOW SETTINGS

PATH: Expert - Analyzer set up - Physical measurement parameters (press MORE)

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

Note: Values when analyzer was calibrated at the factory

POWER SUPPLY VOLTAGES

PATH: Technical - Diagnostics - Analyzer module diagnostics - Power supply voltages

PREAMP GAIN

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters

PRESSURE COMPENSATION

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Barometric pressure compensation

PRESSURES AND FLOWS

PATH: Expert - Analyzer control - Physical measurement

PATH: Technical - Diagnostics - Analyzer module diagnostics - Physical measurement parameters

PROPANE VS. METHANE

PATH: Expert - Analyzer set up - Calibration gas list - Calibration gas response factor

Note: Set to 1 for methane, 3.14 for propane

PURGE GAS SWITCH STATUS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Miscellaneous control parameters

PVA FREQUENCY

PATH: Expert - Analyzer set up - Gas measurement parameters - Response time/delay parameters

RANGE

PATH: Basic - Measurement range number

RANGE LIMIT – CURRENT

PATH: Basic - Range upper limit Not editable

RANGE LIMIT LIMITS

PATH: Technical - Service - Manufacturing - Analyzer module data - Range n upper limit:

Note: Be careful!

RANGE LIMITS

PATH: Expert - Analyzer set up - Gas Measurement Parameters - Range settings

PATH: Expert - Analyzer controls - Range settings

Note: Limited by max. & min range in Manufacturing data screen

RANGES WITH VALID CALIBRATION

PATH: Basic - Ranges with valid calibration

Note: How many ranges were calibrated last time

RAW SIGNAL

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters

REMOTE CONTROL

PATH: Basic – Control

Note: Requires an I/O module

RESETTING EEPROM

PATH: Technical - Service - Manufacturing - Analyzer module data - RESET

RESETTING SOFTWARE ERRORS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Software diagnostics

Note: Use “Edit to reset”

RESETTING STORED DATA

PATH: Technical - Diagnostics - Analyzer diagnostics - Start up analyzer - INIT

RESPONSE TIME

PATH: N/A

Note: Not applicable for a GC.

RESTARTING ANALYZER

PATH: Technical - Diagnostics - Analyzer module diagnostics - Start up analyzer - REBOOT

RESTORING SPAN AND ZERO FACTORS

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - Range n factors - HISTORY - RSTR MN or RSTR ST

Note: MN = manufacturing data, ST = historical data

REVISION NUMBERS

PATH: Technical - Service - Manufacturing - Analyzer module data - software revision number

Note: Not editable

SAMPLE BYPASS FLOW

PATH: Expert - Analyzer control - Physical measurements

PATH: Expert - Analyzer set up - Physical measurement parameters

SAMPLE BYPASS FLOW ALARM LIMITS

PATH: Expert - Analyzer control - Physical measurements

SAMPLE FLOW

PATH: Basic - Bypass sample flow

SAMPLE PRESSURE

PATH: Expert - Analyzer control - Physical measurements

PATH: Expert - Analyzer set up - Physical measurement parameters

SAMPLE PRESSURE ALARM LIMITS

PATH: Expert - Analyzer set up - Physical measurement parameters - Pressure limits

SCREEN DISPLAY LINES

PATH: Expert - Analyzer set up - Displayed parameters

Note: Also select the source module in Control module menus

SELF TEST

PATH: Technical - Diagnostics - Analyzer module diagnostics - Self test

SERIAL NUMBER

PATH: Technical - Service - Manufacturing - Analyzer module data - Serial number

SERVICE DATES

PATH: Technical - Service - Service history - Analyzer module service history

SERVICE NOTES

PATH: Technical - Service - Service history - Analyzer module service history

SET RANGE

PATH: Basic - Ranges

SETTING IGNITION PARAMETERS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Auto ignition parameters

SIGNAL GAIN

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters

SOFTWARE DIAGNOSTICS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Software diagnostics

SPAN RANGES SEPARATELY OR TOGETHER

PATH: Expert - Analyzer set up - Calibration parameters - Span ranges

Note: Doesn't work if ranges span the main gain switch point

SPAN ERROR MESSAGE

PATH: Basic - SPAN

SPAN FACTOR

PATH: Expert - Expert Analyzer controls - Zero/span calibration - FACTORS - Range n factors

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Calibration factors - Range n factors

SPAN FUNCTION

PATH: Basic - SPAN

PATH: Expert - Analyzer control - Zero/span calibration

Note: Doesn't control autocal

SPAN GAS VALUES

PATH: Expert - Analyzer set up - Calibration gas list - NEXT as desired

STARTING ANALYZER

PATH: Technical - Diagnostics - Analyzer module diagnostics - Start up analyzer - REBOOT

STORING SPAN AND ZERO DATA

PATH: Expert - Expert Analyzer controls - Calibration factors - NEXT - STORE

TAG

PATH: Expert - Analyzer set up - Analyzer tag

PATH: Technical - Service - Manufacturing - Analyzer manufacturing data

TEMPERATURE ALARM LIMITS

PATH: Expert - Analyzer set up - Physical measurement parameters - Temperature limits

TEMPERATURE CONTROL PARAMETERS

PATH: Technical - Diagnostics - Analyzer module diagnostics - Temperature control parameters

TEMPERATURE MEASUREMENTS

PATH: Expert - Analyzer set up - Physical measurement parameters (press MORE)

TREND DATA CONTROL

PATH: Technical - Diagnostics - Analyzer module diagnostics - Trend display control

Note: Stores data for 24 hours, but needs a PC to display it

UNITS

PATH: Expert - Analyzer set up - Gas measurement parameters - Units

VALVE POSITION

PATH: Basic - Measurement cycle position

VOLTAGES

PATH: Technical - Diagnostics - Analyzer module diagnostics - Power supply voltages

ZERO ERROR MESSAGE

PATH: Basic - ZERO

ZERO FUNCTION BASIC - ZERO

PATH: Expert - Analyzer control - Zero/span calibration

Note: Doesn't control autocal

ZERO GAS VALUES

PATH: Expert - Analyzer set up - Calibration gas list

ZERO OFFSET

PATH: Expert - Expert Analyzer controls - Calibration factors - NEXT

PATH: Technical - Diagnostics - Analyzer module diagnostics - Primary variable parameters - Calibration factors - NEXT

ZERO RANGES TOGETHER OR SEPARATELY

PATH: Expert - Analyzer set up - Calibration parameters - Zero ranges

Note: Doesn’t work if ranges span the main gain switch point

APPENDIX D. FID 2 MENU STRUCTURE

D.1 BASIC CONTROL MENUS

The softkey marked MENU leads to the "Main menu".

MAIN MENU:

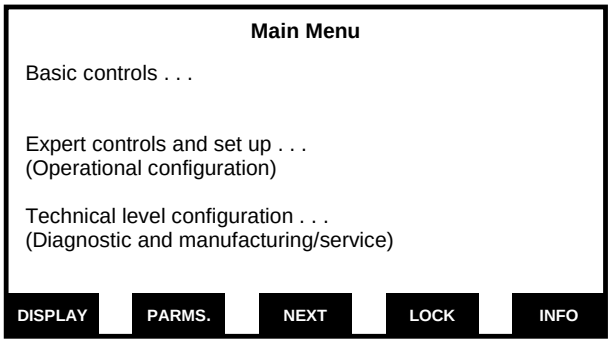


FIGURE D-1. MAIN MENU

Three divisions, corresponding to Operation, set up (and advanced operation), and diagnostics and support.

BASIC CONTROLS MENU:

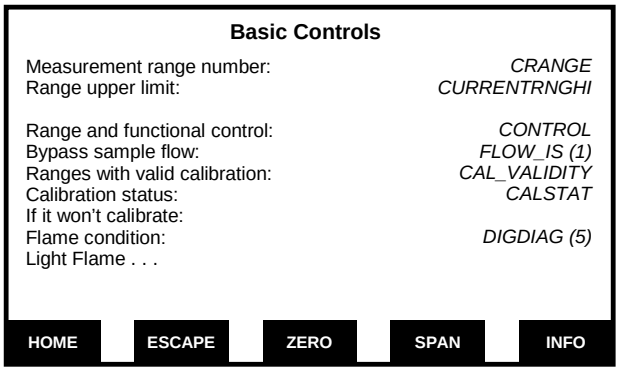


FIGURE D-2. BASIC CONTROL MENU

CURRENTRNGHI shows the current value of the active range full scale limit.

CONTROL allows an I/O module to control the ranges; it doesn't affect a PC.

CAL_VALIDITY shows the ranges that were validly calibrated during the last calibration performed.

CALSTAT shows whether the unit is currently calibrating, providing feedback when the **ZERO** or **SPAN** softkeys are pressed.

ANALYZER ZERO MENU:

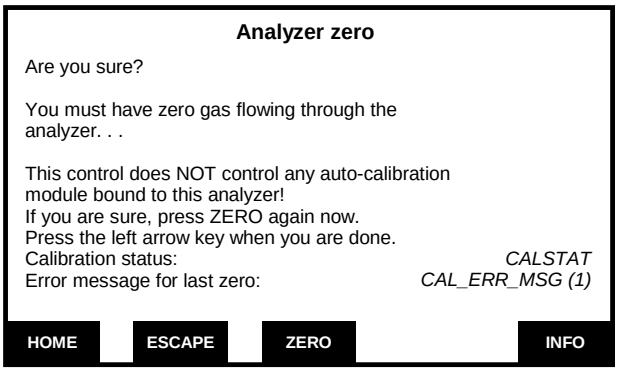


FIGURE D-3. ZERO "ARE YOU SURE?" MENU

ZERO will measure the zero gas, monitor the reading for stability and adjust the zero factor until the reading is within 0.02% of the current fullscale range, of the target zero value.

The span menu is similar.

LIGHT FLAME MENU:

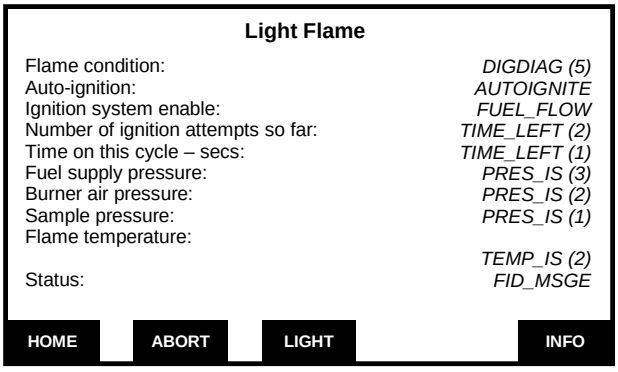


FIGURE D-4. LIGHT FLAME MENU

Auto-ignition refers to the unit's automatically enriching the mixture and going through its ignite sequence, not re-lighting the flame if it has gone out. This latter is not available for safety reasons.

To start cycle, press **LIGHT** softkey. The unit will attempt ignition cycle until the flame is on, or the selected number of cycles is completed.

When no ignition results, a failure message will appear at the bottom of the screen.

D.2 EXPERT CONTROL MENUS

Starting with the main menu again:

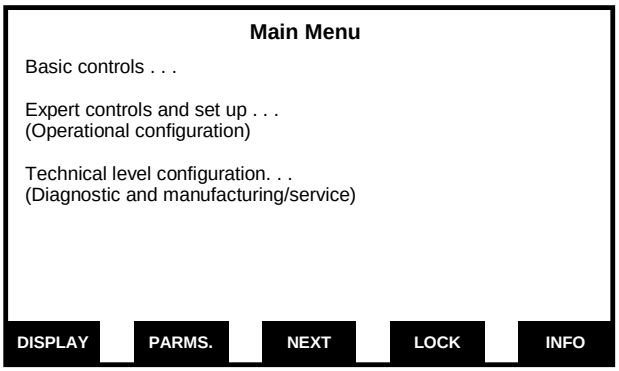


FIGURE D-5. MAIN MENU

EXPERT CONTROLS AND SET UP MENU:

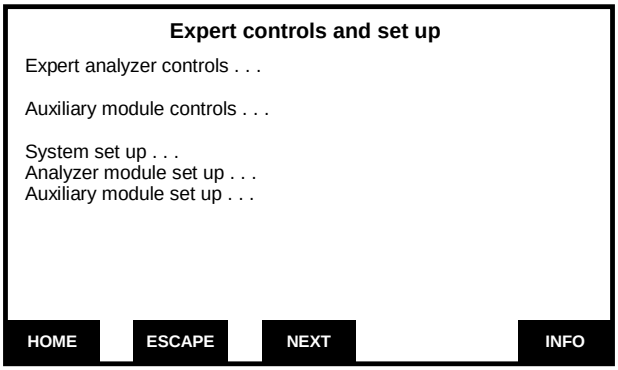


FIGURE D-6. EXPERT CONTROLS AND SETUP MENU

Select the module (or subnode via **NEXT**) to control or set up.

EXPERT CONTROLS MENU:

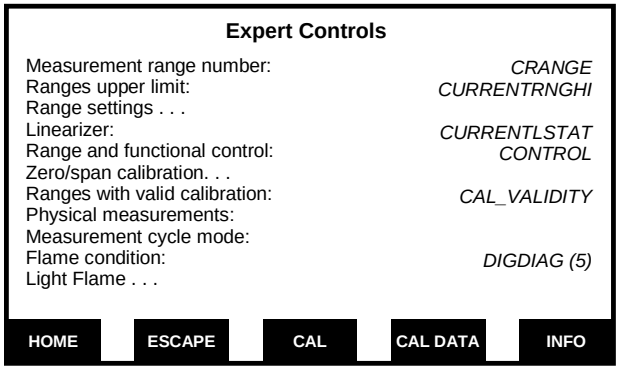


FIGURE D-7. EXPERT CONTROLS MENU

Similar to basic controls except with more information.

RANGE SETTINGS MENU:

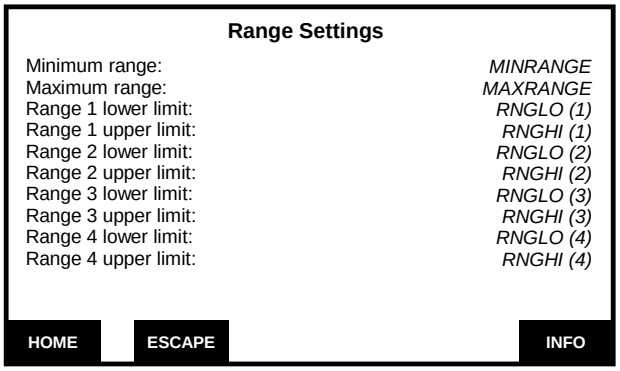


FIGURE D-8. RANGE SETTINGS MENU

Minimum and maximum ranges are set in the manufacturing data menu, and can't be edited here. You can't edit a range to a higher or lower value than these, respectively.

ZERO/SPAN CALIBRATION MENU – ZERO:

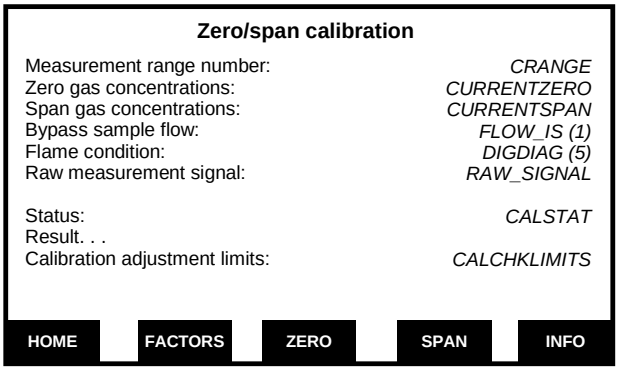


FIGURE D-9. ZERO/SPAN CALIBRATION MENU - ZERO

FACTORS leads to the calibration factors menu, see the appropriate section below.

ZERO leads to the zero menu.

SPAN leads to the span menu.

Result. . . leads to a menu that shows the results of the most recent calibration.

ANALYZER ZERO MENU:

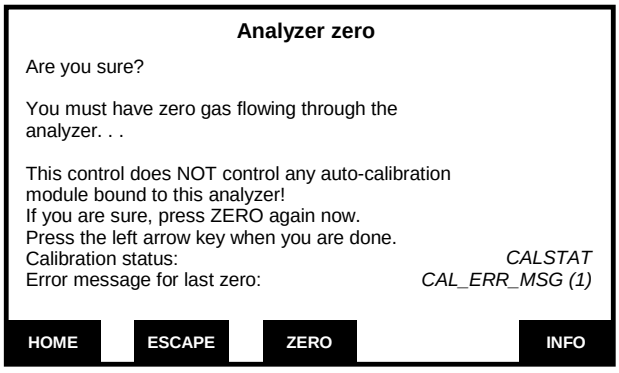


FIGURE D-10. ANALYZER ZERO MENU

Press **ZERO** again to make the analyzer perform zero.

ZERO/SPAN DIAGNOSTIC DATA MENU:

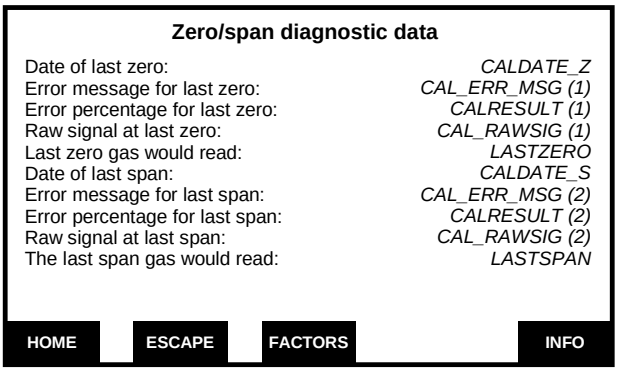


FIGURE D-11. ZERO/SPAN DIAGNOSTIC DATA MENU

LASTZERO and ***LASTSPAN*** show what the last zero and span would have read if the most recent calibration factors had been used to measure those gases.

FACTORS once again leads to the calibration factors menus.

(Also Light Flame as under Basic Controls)

D.3 ANALYZER SETUP MENUS

Starting from the Expert controls and setup. . .

ANALYZER MODULE SET UP MENU:

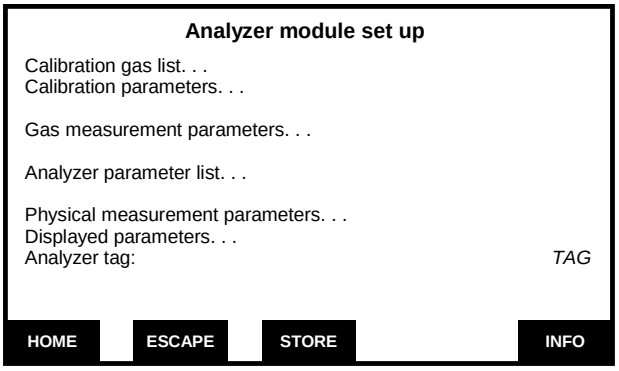


FIGURE D-12. ANALYZER MODULE SET UP MENU

TAG contains the name you can assign to this analyzer, and you can address it by this name using the DDE server in a PC.

CALIBRATION GAS LIST MENU:

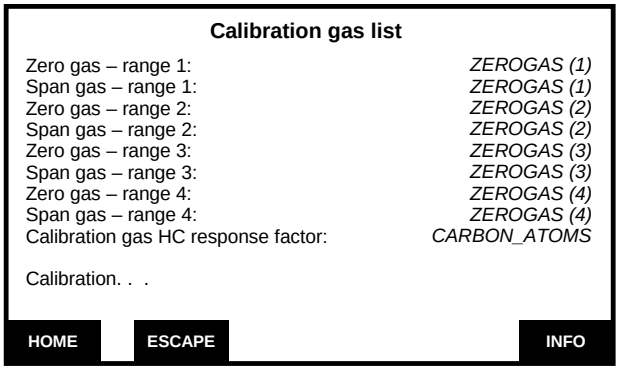


FIGURE D-13. CALIBRATION GAS LIST MENU

This menu shows the calibration gases for each range, and the response factor both for these gases and for the main measurement. This variable ***CARBON_ATOMS*** determines the measurement units, whether in methane or other, such as propane, terms. The calibration gases must be entered in the same terms as those for the measurement – if the measurement is in methane terms, the calibration also has to be in methane terms.

(Leads to expert calibration menu above.)

CALIBRATION PARAMETERS MENU:

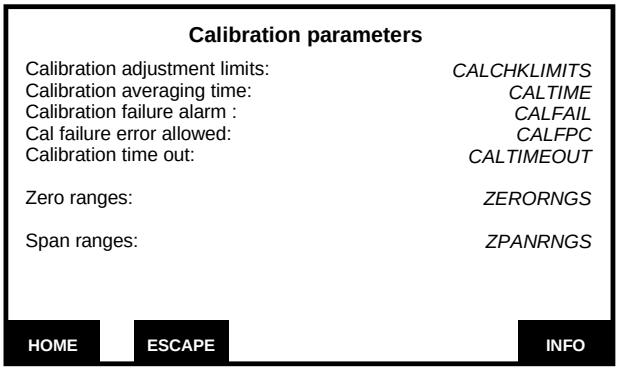


FIGURE D-14. CALIBRATION PARAMETERS MENU

CALCHKLIMITS if enabled forces the analyzer not to accept a calibration if the calibration gas is more than ***CALFPC*** away from the target (as a percentage of the current fullscale range). If disabled it allows calibration no matter how far off the measurement is.

CALTIME sets the time over which the analyzer averages good measurement during the calibration cycle. This value should normally be left in the default setting.

CALFAIL enables (or disables) the specific calibration failure alarm. If the analyzer determines that it cannot perform any of the possible calibrations, the calibration failure specific alarm will be set if ***CALFAIL*** is enabled.

CALFPC determines the allowable calibration error if ***CALCHKLIMITS*** is enabled. ***CALFPC*** is a percentage of the range on which the calibration is currently being performed. It is normally left at 5%.

CALTIMEOUT determines how long the analyzer will wait for a stable reading before performing the calibration. Once this time has passed, the analyzer will calibrate anyway, though if the result is out of the ***CALFPC*** limits and ***CALCHKLIMITS*** is set, the calibration will not be accepted.

ZERORNGS determines whether the analyzer will attempt to zero all the ranges at once (see the discussion elsewhere on the possibility of this).

CALRANGES allows you to calibrate all the ranges at once, if the calibration gas is less than 110% of the fullscale value of each range.

GAS MEASUREMENT PARAMETERS MENU:

From the Analyzer Module set up menu leads to the following menu:

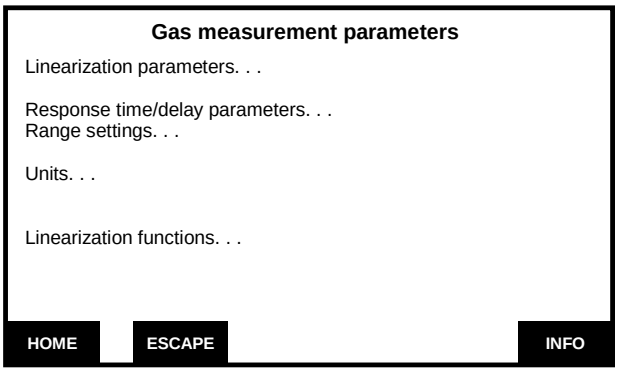


FIGURE D-15. GAS MEASUREMENT PARAMETERS MENU

Linearization parameters leads to the linearization menus.

You can assign any of the four available polynomial linearizers to any range. See the menus below for this.

LINEARIZATION PARAMETERS MENU:

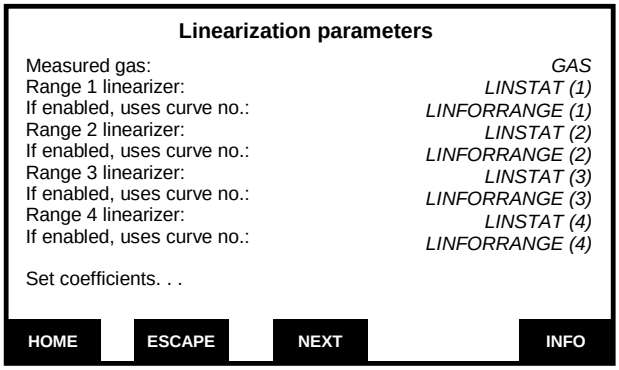


FIGURE D-16. LINEARIZATION PARAMETERS

Sets up the operation of the linearizer if any on the range identified by ***LINFORRANGE***. Note that you can set up the same linearizer to operate on any number of ranges – but you'll use the same curve on all of them. Generally linearization should not be necessary.

LINEARITY COEFFICIENTS MENU:

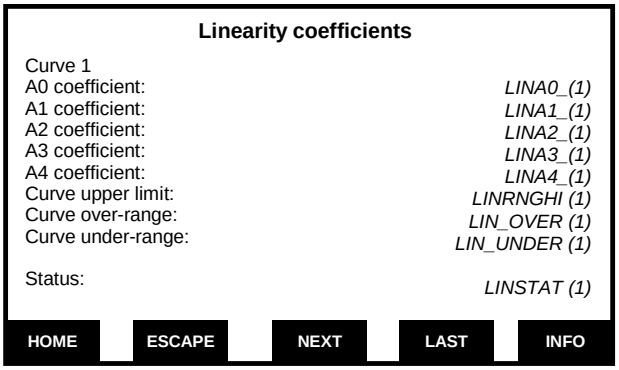


FIGURE D-17. LINEARITY COEFFICIENTS MENU

Curve 2, 3, 4 menus are similar. The coefficients must add up to 1 to within 0.2% to achieve a 0.2% linearity. The A0 coefficient is the zero offset, and it should normally be set to zero. The upper limit shows the range over which the linearizer can work – and the over and under range percentages show the limit points.

Outside this range the transfer function will be a straight line whose slope is the gradient of the linearizer curve at the end point. This stops an inflected curve from playing havoc with the calibration algorithms.

Also, the curve must be uninflected! Any negative slope will make the calibration fail. The analyzer will detect this and fail to calibrate.

RESPONSE TIME/DELAY PARAMETERS MENU:

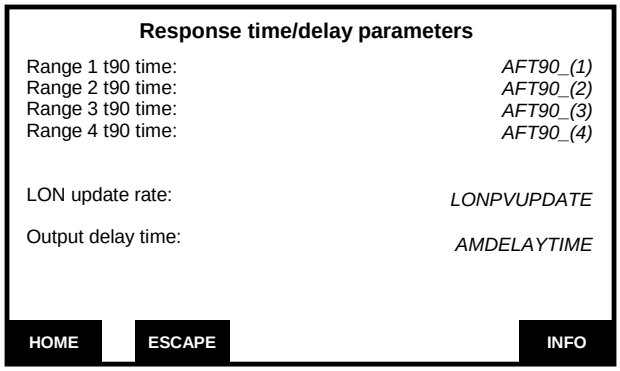


FIGURE D-18. RESPONSE TIME/DELAY PARAMETERS MENU

AFT90_ determines the filtering applied to each range. The time value is the time constant of the filter applied. This value also affects the degree of the median filter used.

The ***LONPVUPDATE*** variable controls how fast the analyzer puts the PVA signal (the main reading) onto the LON network. For normal operation this should be set to 10 samples per second, but for fastest performance set it to ASAP. If you have more than four analyzers on one network, setting all the analyzers to ASAP may overload the network, showing up as sluggish menu response. In this case, set them to 10 per second.

AMDELAYTIME determines the group delay of the PVA signal from this analyzer. It may be set between 0 and 30 seconds. Its effect is to delay the PVA from this analyzer by that amount, useful if you are trying to synchronize several analyzers that are measuring a common sample.

UNITS MENU:

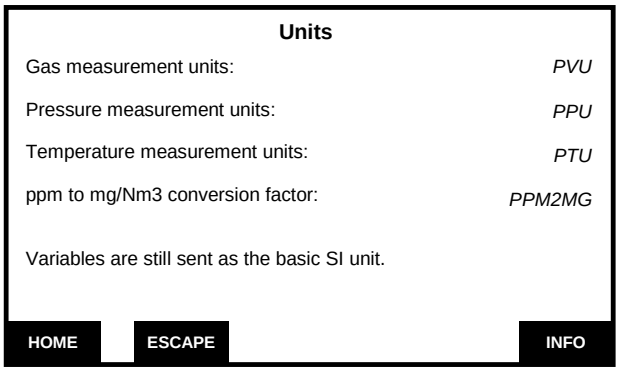


FIGURE D-19. UNITS MENU

Controls the units of these values as displayed on the control module screen and as reported by the DDE server when in "Native" mode. The actual variable contents are always in SI units.

The SI pressure unit is hPa (hecto-Pascals). These are supposed to be absolute pressures, but enough people find this confusing that we decided to report them as gauge pressures instead, using hPa as the "unit". Generally (except for barometric pressure readings) all NGA pressure readings are gauge.

Range settings are as described above.

Linearization functions leads to a series of screens that support such self-linearization capabilities as this analyzer has. As with most NGA analyzers, the polynomial self-linearization function is not enabled, while the mid-point correction is. The former menus are not described here. The midpoint correction allows you to set up to 3 mid points as well as the zero and span point for each range, such that the analyzer's transfer function is a series of straight lines passing through these points. This correction is in addition to any polynomial linearization applied. This function may be used to force agreement with arbitrary mid-point gases whose values are accepted for regulatory reasons, despite any evidence to the contrary.

MIDPOINT CORRECTION SET UP MENU:

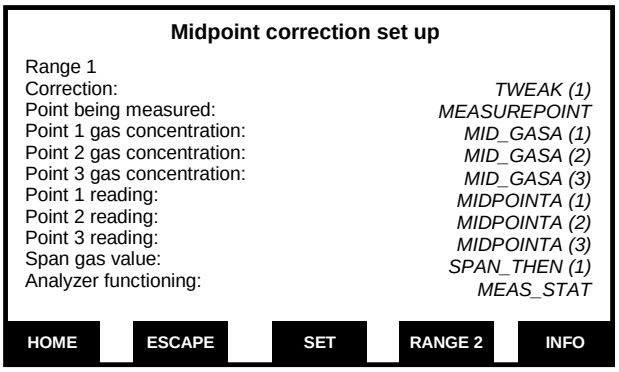


FIGURE D-20. MIDPOINT CORRECTION SET UP MENU

TWEAK enables this function. Set this to enabled after you have performed the following procedure.

Set the point to be measured with ***MEASUREPOINT***. Set its intended value with ***MID_GASA(1)***. Allow the gas to flow, and when the reading has stabilized, press **SET** softkey. Repeat with ***MID_GASA (2)*** and ***MID_GASA (3).***

The current span gas value is stored in ***SPAN_THEN*** for this range.

MEAS_STAT tells you what the analyzer is doing while you are doing this.

PHYSICAL MEASUREMENT PARAMETERS MENU:

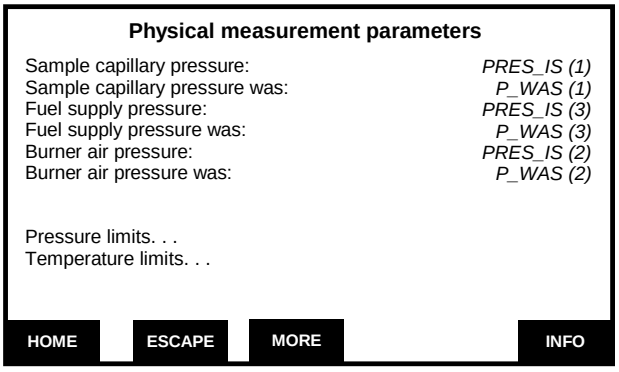


FIGURE D-21. PHYSICAL MEASUREMENT PARAMETERS MENU

This menu shows the current values of the various pressures, together with their values when they were stored. Pressure are quite critical, so this screen should be examined if the analyzer does not seem to be performing correctly.

Temperatures and bypass sample flow are shown on the menu linked to the **MORE** softkey.

PHYSICAL MEASUREMENT PARAMETERS MENU (MORE):

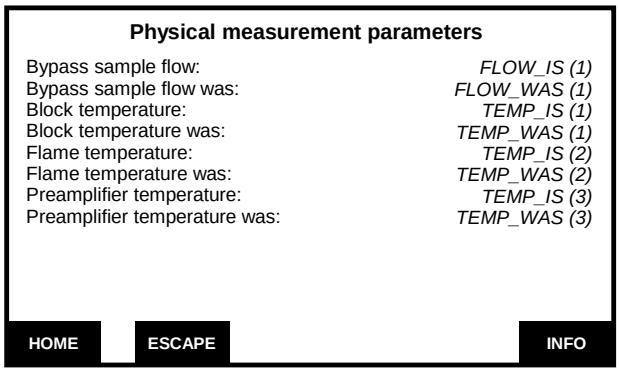


FIGURE D-22. PHYSICAL MEASUREMENT PARAMETERS (MORE) MENU

PRESSURE LIMITS MENU AND TEMPERATURE LIMITS MENU:

Pressure and temperature alarm limits are shown on the next two screens. These menus allow you to set the diagnostic limits to the pressure and temperature values. If the limits are exceeded, and alarms are enabled, a **WARNING** alarm will be issued and ***GENERALSTATE*** will show the value **WARNING** also.

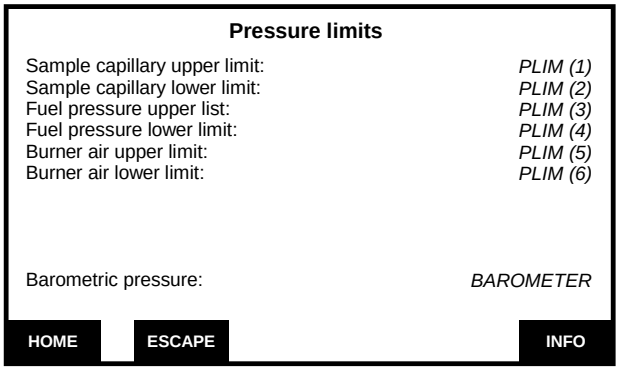


FIGURE D-23. PRESSURE LIMITS MENU

This also shows the barometric pressure read from another analyzer itself capable of reading this. This value will only be updated if that other analyzer is set to put its barometric pressure out on the network, and then only if there is a control module also on the network.

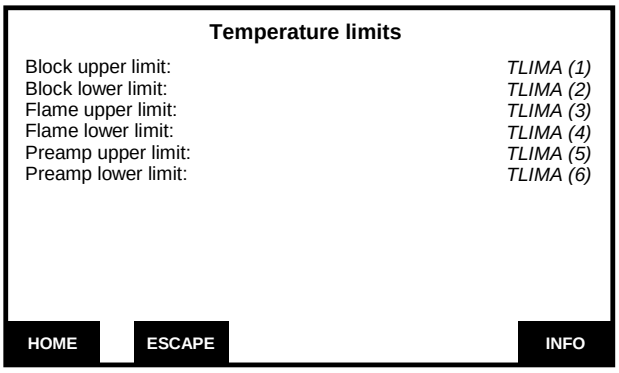


FIGURE D-24. TEMPERATURE LIMITS MENU

Back to the Analyzer module set up menu: It next leads to this…

DISPLAYED PARAMETERS MENU:

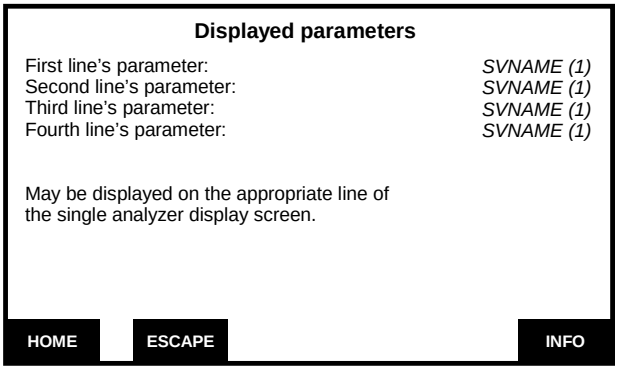


FIGURE D-25. DISPLAYED PARAMETERS MENU

Used in conjunction with the display selection menus in the system set up section of the control module menus. The lines referred to are the auxiliary lines on the single output display screen.

TAG is the means of identifying this analyzer on the main display screens and also through the DDE server.

In the analyzer set up menu the softkey **STORE** leads to the following:

STORE/RESTORE USER SETTING MENU:

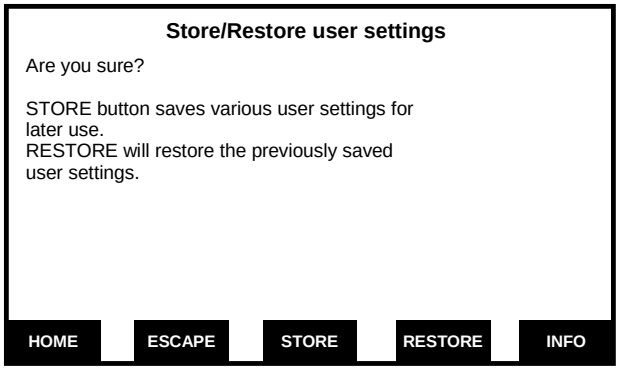


FIGURE D-26. STORE/RESTORE USER SETTING MENU

STORE stores all the configuration variables into the "ZZ" prefixed variable set. **RESTORE** restores them all into the current variables.

D.4 ANALYZER TECHNICAL CONFIGURATION MENUS

Once again starting with the Main menu…

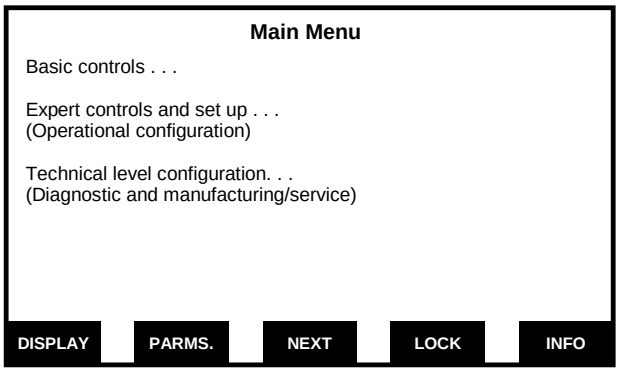


FIGURE D-27. MAIN MENU

TECHNICAL CONFIGURATION MENU:

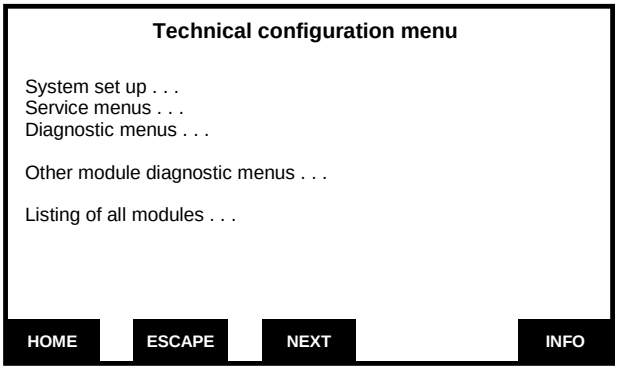


FIGURE D-28. TECHNICAL CONFIGURATION MENU

SERVICE MENUS:

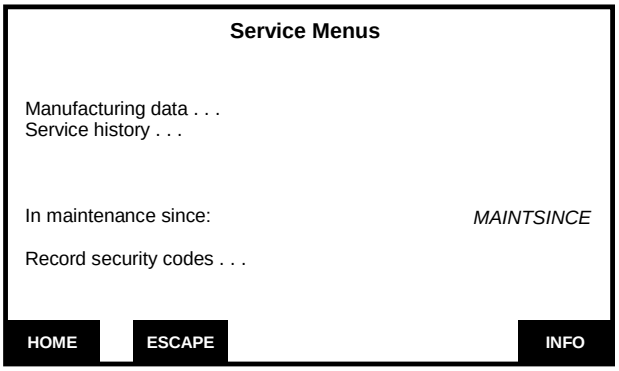


FIGURE D-29. CONTROL MODULE SERVICE MENU

MANUFACTURING DATA MENU:

FIGURE D-30. CONTROL MODULE MANUFACTURING DATA SELECTION MENU

ANALYZER MANUFACTURING DATA MENU:

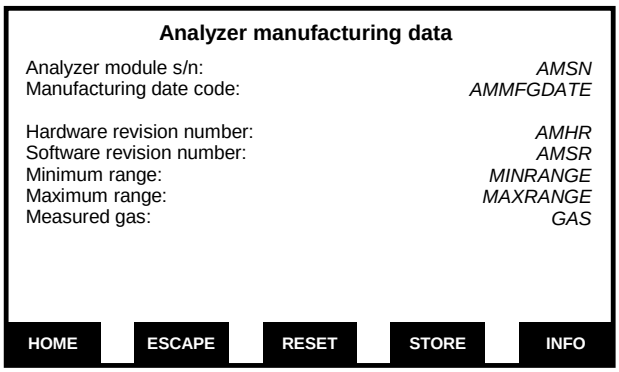


FIGURE D-31. ANALYZER MANUFACTURING DATA

Shows the original manufacturing data (unless you have edited it!)

RESET will restore the PROM default values of all the variables, erasing *ALL* the calibration, set up and manufacturing data. There is an "Are you sure?" menu under this softkey.

STORE will store current values into all of the "Was" lines in the diagnostic menus below. Press this softkey when you are sure that the unit is operating correctly to get a reference for the future.

SERVICE HISTORY MENU:

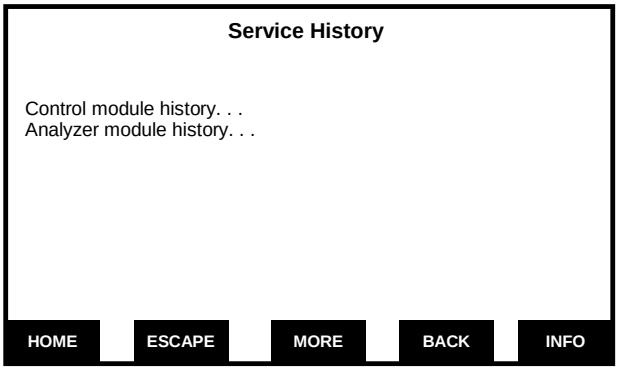


FIGURE D-32. CONTROL MODULE SERVICE HISTORY SELECTION MENU

ANALYZER MODULE SERVICE HISTORY MENU:

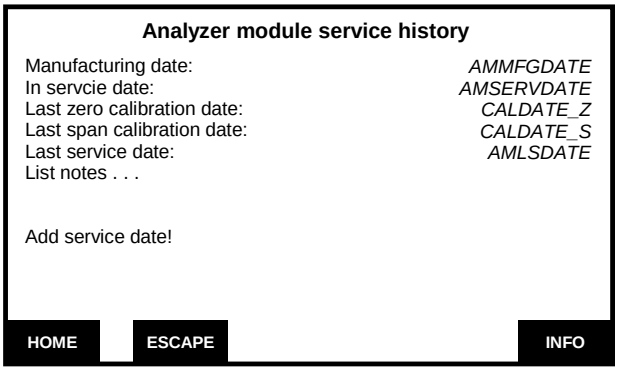


FIGURE D-33. ANALYZER SERVICE HISTORY MENU

Service people enter service dates and list notes as to what service was performed.

ANALYZER MODULE SERVICE NOTES MENU:

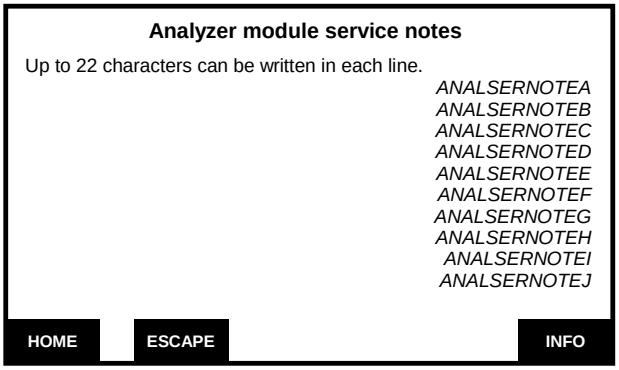


FIGURE D-34. ANALYZER MODULE SERVICE NOTES

There is a list of service abbreviations in the control module help for the equivalent menu. The service performed and date are enter here.

D.5 DIAGNOSTIC MENUS

DIAGNOSTIC MENUS:

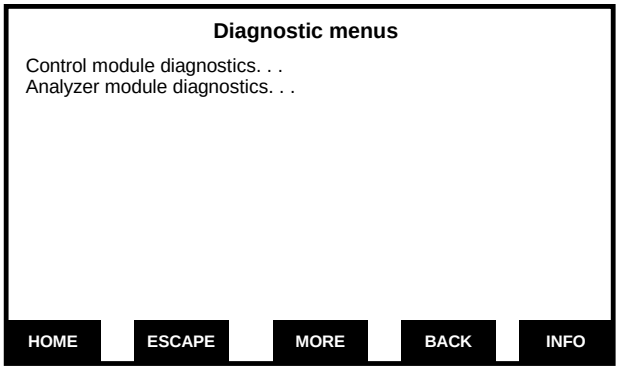


FIGURE D-35. CONTROL MODULE DIAGNOSTIC SELECTION MENU

ANALYZER DIAGNOSTICS MENU:

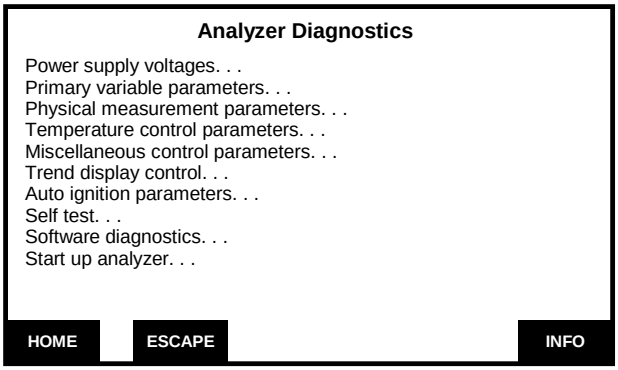


FIGURE D-36. ANALYZER DIAGNOSTICS MENU

POWER SUPPLY VOLTAGES MENU:

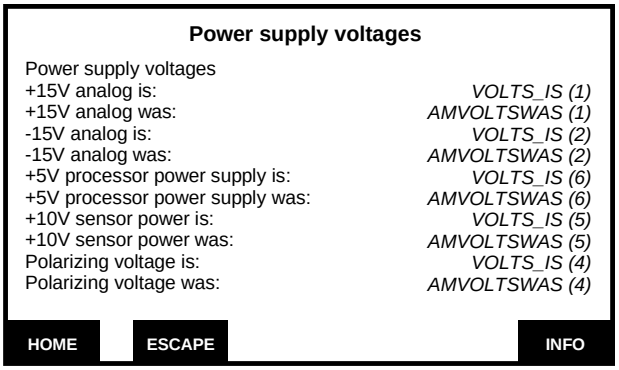


FIGURE D-37. POWER SUPPLY VOLTAGES MENU

Shows current values and the historical values of power supply voltages. Any significant differences indicate a problem. If all of the values are very significantly wrong, it indicates a failure of the reference voltage in the Computer Board, or some other failure on that board.

PRIMARY VARIABLE PARAMETERS MENU:

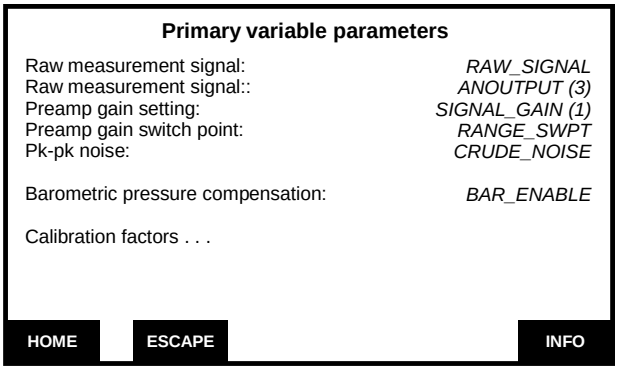


FIGURE D-38. PRIMARY VARIABLE PARAMETERS MENU

The ***RAW_SIGNAL*** variable contains the current filtered detector signal in counts.

ANOUTPUT (3) is the signal being sent to the analog output available on the front panel of the analyzer, and used for diagnostic purposes.

SIGNAL_GAIN (1) shows the gain setting of the preamplifier. This cannot be directly edited, but the gain switch point ***RANGE_SWPT*** may be.

CRUDE_NOISE shows the noise level detected on the input signal before the filtering, expressed in counts peak-to-peak.

The barometric pressure compensation will only work if this analyzer is in a system with another analyzer capable of measuring barometric pressure, and set to export its reading on the network. A control module is required for this to be effective, a system using only a PC without control module emulation will not allow this feature. This value is only measured during the zero points.

CALIBRATION FACTORS MENU:

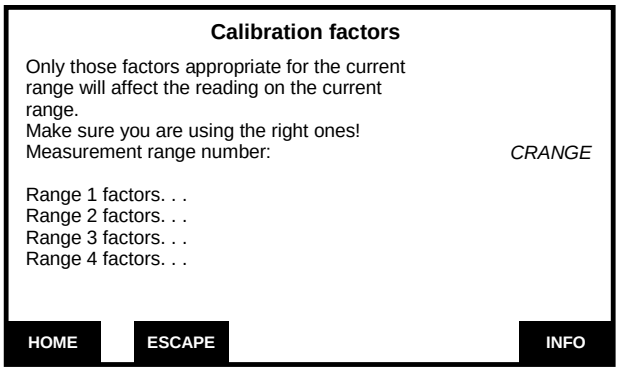


FIGURE D-39. CALIBRATION FACTORS SELECTION MENU

RANGE 1 FACTORS MENU:

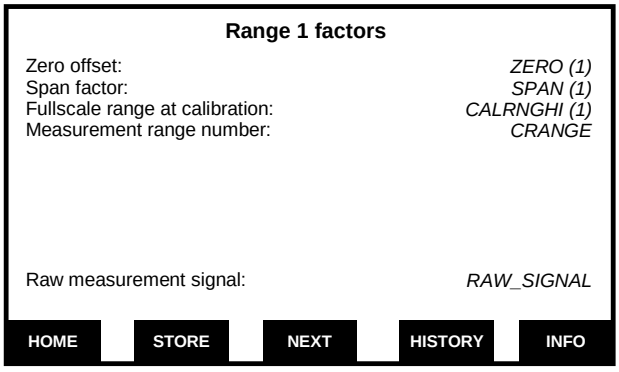


FIGURE D-40. RANGE 1 FACTORS MENU

The zero and span factors are calculated by the calibration functions, but they may be directly edited. They are individual to each range, and the active range may be chosen to match the range factors on this screen for convenience.

RAW_SIGNAL is also displayed so that you can tell if the analyzer is responding to span gases.

You can store a know good calibration by pressing the **STORE** softkey, and examine the comparison between the factors stored during manufacturing on the next screen.

RANGE 1 FACTORS HISTORY MENU:

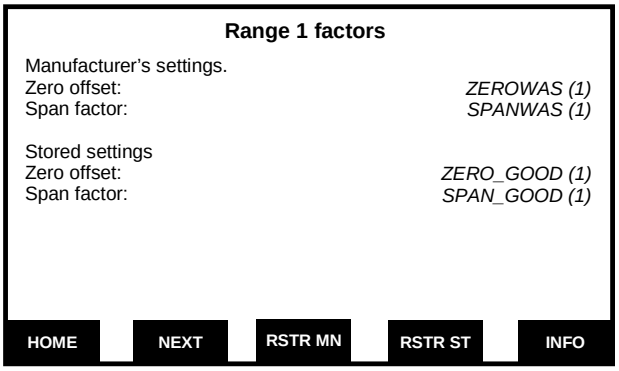


FIGURE D-41. RANGE 1 FACTORS HISTORY MENU

Pressing the **RSTR MN** or **RSTR ST** softkeys will write the manufacturing or user stored values back into the current values.

Similar menus exist for all four ranges.

PHYSICAL MEASUREMENT PARAMETERS MENU:

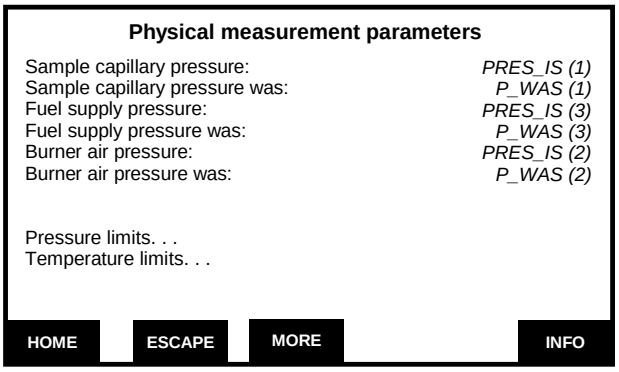


FIGURE D-42. PHYSICAL MEASUREMENT PARAMETERS MENU

Described above in Section D.2 Expert Control Menus.

TEMPERATURE CONTROL MENU:

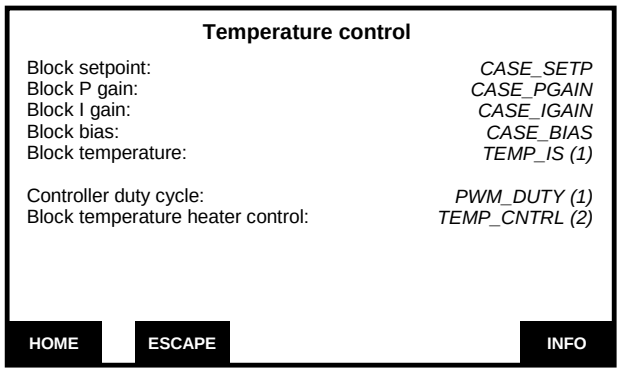


FIGURE D-43. TEMPERATURE CONTROL PARAMETERS MENU

Lists the manifold block control parameters and setpoints. You can change the block setpoint as desired for the application, but the P gain (P = proportional) and I gain (I = Integral) and bias parameters are critical and should *NOT UNDER ANY CIRCUMSTANCES BE ALTERED.*

TEMP_CNTRL (2) enables manifold block temperature control.

MISCELLANEOUS CONTROL PARAMETERS MENU:

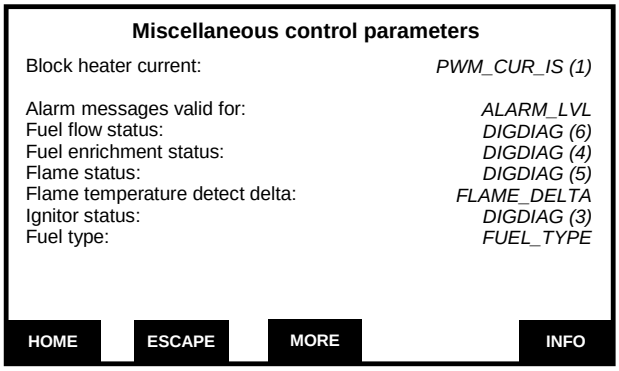


FIGURE D-44. MISCELLANEOUS CONTROL PARAMETERS MENU

Shows miscellaneous status values. The ***Block heater current*** measured is the actual current through the heater control FET's.

The ***Flame temperature detect delta*** is the temperature difference between the flame thermistor measurement and the oven temperature, required for the software to believe that the flame is actually on.

MISCELLANEOUS CONTROL PARAMETERS MENU (MORE):

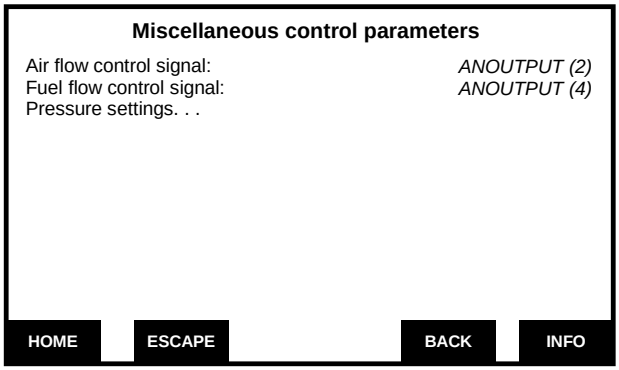


FIGURE D-45. MISCELLANEOUS CONTROL PARAMETERS (MORE) MENU

The gas control fluistors are controlled by an analog signal from three channels of the 12-bit DAC on the Computer Board. The signals are the voltage value of these outputs.

PRESSURE SETTINGS MENU:

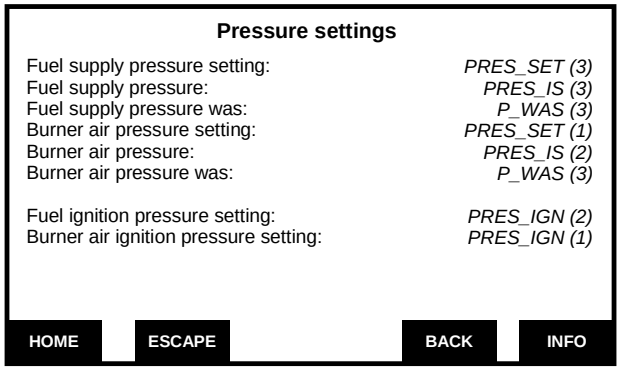


FIGURE D-46. PRESSURE SETTINGS MENU

Shows current and historical values of the pressure settings. Earlier section of this manual discuss what these should be.

TREND DISPLAY CONTROL MENU:

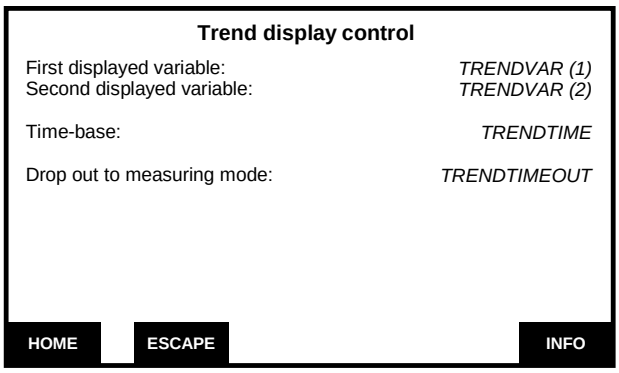


FIGURE D-47. TREND DISPLAY CONTROL MENU

The trend storage will store fifteen minute averages of the selected variables for 24 hours. This is volatile storage, and therefore will evaporate if power fails.

AUTO IGNITION PARAMETERS MENU:

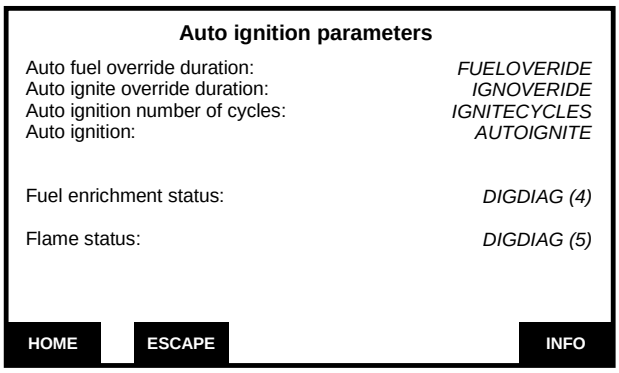


FIGURE D-48. AUTO IGNITION PARAMETERS MENU

FUELOVERIDE sets how long the fuel is enriched before an ignition occurs during auto ignition.

IGNOVERIDE determines how long the ignitor is left on during an ignition attempt.

IGNITECYCLES determines how may attempts the auto ignition sequence will make before giving up if the flame does not ignite.

SELF TEST RESULTS MENU:

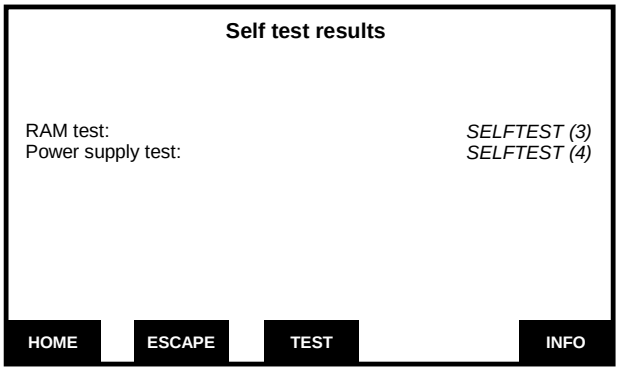


FIGURE D-49. SELF TEST RESULTS

Shows the results of a series of tests the analyzer does on itself on start up.

SOFTWARE DIAGNOSTICS MENU:

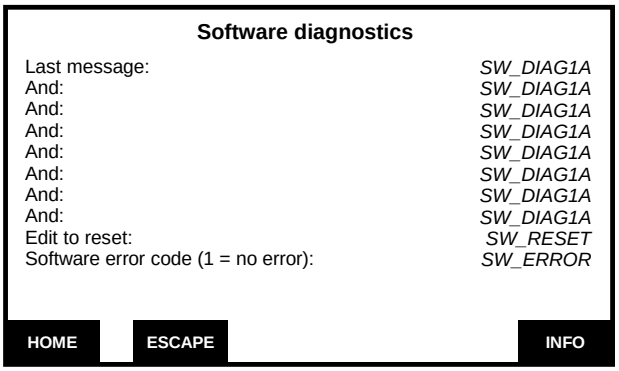


FIGURE D-50. SOFTWARE DIAGNOSTICS MENU

If a software error occurs, it is trapped into the series of variables shown here. Normally the only error that appears is one in “Menu_db” which merely reports that a menu transfer attempt did not work, but the software recovers from this without any noticeable effect. Any other error may be important – if the analyzer doesn’t seem to work, note whatever this says and report it to a service technician.

The menu only reports the *first* error, not any subsequent errors. Therefore if it is showing something, once noted, it should be erased by editing ***SW_RESET***.

ANALYZER STARTING UP MENU:

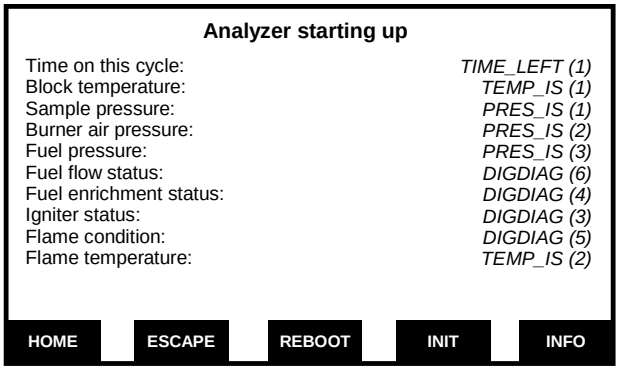


FIGURE D-51. ANALYZER STARTING UP MENU

Shows the critical parameters useful to see during start up. The readings won't be right until the unit is completely warmed up.

INIT leads to …

RE-INITIALIZE THE ANALYZER MENU:

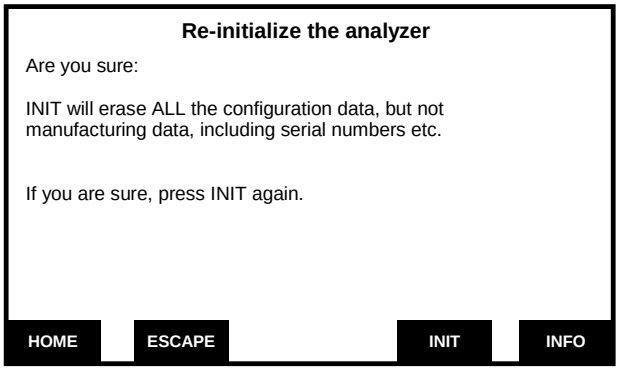


FIGURE D-52. RE-INITIALIZE MENU

Don't do this if you are not sure!

Unlike the similar softkey in the manufacturing data screen, this **INIT** leaves manufacturing data alone.

NOTES

APPENDIX E. FID 2 IDENTIFICATION MATRIX

Each analyzer is configured per the customer sales order. Below is the FID2 sales matrix which lists the various configurations available.

To identify the configuration of an analyzer, locate analyzer name-rating plate. The FID2 has two (identical) name-rating plates, one located on the rear of the front panel (inside the analyzer), and the second located on the front-right-side of the analyzer cover (viewing analyzer from front panel). The 12-position sales matrix identifier number appears on the analyzer name-rating plate.

FID2	NGA 2000 HYDROCARBON ANALYZER - FID2 (ANALYZER MODULE)

Code	Configuration Identifier
A10	Mixed Fuel, 4 Selectable Ranges: 0-10 to 0-5000 ppm CH4
A19	Mixed Fuel, 4 Factory Calibrated Ranges 0-10 to 0-5000 ppm CH4
A20	Mixed Fuel, 4 Selectable Ranges: 0-100 to 0-10,000 ppm CH4
A29	Mixed Fuel, 4 Factory Calibrated Ranges: 0-100 to 0-10,000 ppm CH4

ZZZZ	No Selection

Code	Sample Inlet
A	User Controlled Sample Flow (No Restrictor)
G	Low Pressure Sample (2# Inlet Restrictor)
Z	Standard Sample (7.5# Inlet Restrictor)

FID2	A10	ZZZZ	Z	Example

NOTES

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

Edited from selected paragraphs of the Compressed Gas Association's "Handbook of Compressed Gases" published in 1981
Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202
Used by Permission

1. Never drop cylinders or permit them to strike each other violently.
2. Cylinders may be stored in the open, but in such cases, should be protected against extremes of weather and, to prevent rusting, from the dampness of the ground. Cylinders should be stored in the shade when located in areas where extreme temperatures are prevalent.
3. The valve protection cap should be left on each cylinder until it has been secured against a wall or bench, or placed in a cylinder stand, and is ready to be used.
4. Avoid dragging, rolling, or sliding cylinders, even for a short distance; they should be moved by using a suitable hand-truck.
5. Never tamper with safety devices in valves or cylinders.
6. Do not store full and empty cylinders together. Serious suckback can occur when an empty cylinder is attached to a pressurized system.
7. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.
8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.

Rosemount Analytical Inc.
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For order administration, replacement Parts, application assistance, on-site or factory repair, service or maintenance contract information, contact:

Rosemount Analytical Inc.
Process Analytical Division
Customer Service Center
1-800-433-6076

RETURNING PARTS TO THE FACTORY

Before returning parts, contact the Customer Service Center and request a Returned Materials Authorization (RMA) number. Please have the following information when you call: *Model Number, Serial Number, and Purchase Order Number or Sales Order Number.*

Prior authorization by the factory must be obtained before returned materials will be accepted. Unauthorized returns will be returned to the sender, freight collect.

When returning any product or component that has been exposed to a toxic, corrosive or other hazardous material or used in such a hazardous environment, the user must attach an appropriate Material Safety Data Sheet (M.S.D.S.) or a written certification that the material has been decontaminated, disinfected and/or detoxified.

Return to:

Rosemount Analytical Inc.
4125 East La Palma Avenue
Anaheim, California 92807-1802

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